College of Pharmacy

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- Mary E. Ray

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Chair, Pharmaceutical Sciences and Experimental Therapeutics

- Jonathan A. Doorn

Chair, Pharmacy Practice and Science

- Arinze Nkemdirim Okere

Managing Director, University of Iowa Pharmaceuticals

- Marlow B. Hicks

Professional degree: PharmD

Professional certificates: emergency medicine and critical care pharmacotherapy; palliative care

Graduate degrees: MS in pharmacy; PhD in pharmacy

Faculty: https://pharmacy.uiowa.edu/people

Website: https://pharmacy.uiowa.edu/

The hallmarks of a University of Iowa pharmacy degree are patient-centered practice, strong grounding in science and evidence-based practice, exploration of career choices through required and elective courses, and exposure to leadership opportunities within the college, the university, and the profession. Career options may include community and/or hospital pharmacy, public service, consulting, long-term care, teaching and research in academia, managed care, pharmaceutical industry, or research careers.

The University of Iowa's PharmD program synthesizes basic scientific principles and practice through caring and communication in an integrated professional program. The role of a pharmacist ranges from managing medication for individuals to shaping national health care policy. Students learn to manage aspects of practice, solve problems, make clinical decisions, clearly communicate ideas, practice ethically, and become leaders in their communities and professions. Students study with professors who, in many cases, are pioneering the development of new drugs and defining the appropriate use of others to solve chronic health problems.

The College of Pharmacy PhD program offers three areas of graduate study: drug discovery and experimental therapeutics, health services research, and pharmaceutics. The major emphasis of these graduate programs is on research and coursework.

The College of Pharmacy collaborates with the College of Public Health to offer the combined Doctor of Pharmacy/MPH degree, and with the Graduate College to offer the Doctor of Pharmacy/MS in informatics degree. In addition, the College of Pharmacy offers a professional Certificate in Emergency Medicine and Critical Care Pharmacotherapy and a professional Certificate in Palliative Care.

College Organization

The College of Pharmacy's faculty and programs are organized in two academic units. These units provide coursework for the Doctor of Pharmacy curriculum and for the college's graduate programs.

Pharmacy Practice and Science

Faculty in Pharmacy Practice and Science (PPS) provide expertise and education in the professional practice of pharmacy. They specialize in a wide variety of clinical pharmacy practices; conduct research on patient and population outcomes related to medication therapy; contribute to the scholarship of teaching and learning in pharmacy education; and provide instruction in the pharmacist's professional role and the safe, effective use of medications.

This unit offers Master of Science and Doctor of Philosophy curricula in health services research, which encompasses the behavioral, economic, social, and administrative sciences; and elements of pharmacy practice. It offers coursework through the Applied Clinical Sciences Division and the Health Services Research Division.

Applied Clinical Sciences (ACS) Division

Teaching and research in this division focus on the delivery of care and related services to patients and the education of student and resident pharmacists in practice settings. Courses are offered in pharmacotherapy, communication and practice skill development, clinical problem solving, and patient care. Professional practice mentoring and education are provided in introductory and advanced pharmacy practice experiences.

Health Services Research (HSR) Division

Teaching and research in this division involve economic, social, behavioral, and administrative components of pharmacy practice and medication use. Courses are offered on the health care system, practice management, the professional and business aspects of pharmacy practice, and learning and applying economic and social psychological theories to the study of health services and medication use.

To learn more about the department and its two divisions, visit Pharmacy Practice and Science on the College of Pharmacy website.

Pharmaceutical Sciences and Experimental Therapeutics

Faculty in Pharmaceutical Sciences and Experimental Therapeutics (PSET) provide expertise and education in areas that include the fundamental basis for drug therapy outcomes in patients, factors responsible for specific drug actions in individual patients and larger patient populations, drug metabolism, pharmaceutical toxicology, organic synthesis,

structure-activity relationships, drug design, computer-aided drug discovery, bioanalytical chemistry, biopolymeric drugs, molecular pharmacology, dosage form development and performance, pharmaceutical applications of nanotechnology, industrial and manufacturing pharmacy, pharmacokinetics, and pharmacodynamics.

In addition to its educational roles in the Doctor of Pharmacy program, PSET offers PhD and MS degrees in two graduate areas: drug discovery and experimental therapeutics and pharmaceutics. Drug discovery and experimental therapeutics is for students interested in drug discovery and the development of novel therapeutics. It includes interdisciplinary research experiences in medicinal chemistry, biotherapeutics, pharmacogenetics/genomics, and basic pharmacology/toxicology. Pharmaceutics focuses on the characterization of pharmaceuticals and their component materials, the development of new dosage forms and drug delivery systems, pharmaceutical applications of nanotechnology, and the pharmacokinetic and pharmacodynamic evaluation of drug actions and interactions.

The department offers interdisciplinary research opportunities with programs in medicine, chemistry, biochemistry, pharmacology, engineering, dentistry, and public health. Its national and international collaborations further enhance the breadth of research activities available to students.

To learn more, visit Pharmaceutical Sciences and Experimental Therapeutics on the College of Pharmacy website.

Programs

Professional Programs of Study

- Doctor of Pharmacy
- Professional Certificate in Emergency Medicine and Critical Care Pharmacotherapy
- Professional Certificate in Palliative Care

Graduate Programs of Study

- Master of Science in Pharmacy
- Doctor of Philosophy in Pharmacy

Facilities

Pharmacy Building

A new, state-of-the-art building has set the stage for advancements in science and discovery, and for world-class pharmacy education to continue to grow and thrive. Classroom space is designed for collaborative and hands-on learning. The building boasts 16 collaborative research spaces and 23 learning spaces—centers and team rooms with aspects of universal design. In addition, the college has added 16,000 square feet of manufacturing space with a sterile products processing facility.

The original facility, now called the Pharmaceutical Sciences Research Building, continues to house classrooms, labs, offices, and a manufacturing facility.

The College of Pharmacy is located on the university's health sciences campus in close proximity to five professional schools. Students collaborate with expert health care providers at the Carver College of Medicine, and at the colleges of Dentistry, Nursing, and Public Health. The College of Pharmacy is located in close proximity to University of Iowa Health Care, the Bowen Science Building, and the Hardin Library for the Health Sciences.

For more than 125 years, the University of Iowa College of Pharmacy has led the way in educating pharmacists and pharmaceutical scientists. The college is well known for its high-quality pharmacy education, advanced practice models, patient care, drug discovery, product development, and contract manufacturing.

University of Iowa Pharmaceuticals

University of Iowa Pharmaceuticals is a pharmaceutical manufacturing facility registered with the U.S. Food and Drug Administration that develops pharmaceutical dosage forms and has manufactured clinical supplies in compliance with Good Manufacturing Practices since 1974. University of Iowa Pharmaceuticals has clients worldwide, including pharmaceutical companies, biotechnology firms, medical departments, and government agencies. Its staff works closely with clients and pharmaceutics faculty members to produce virtually every type of pharmaceutical dosage form, supplying new pharmaceutical agents for use in clinical trials and other research. For more information, visit the UI Pharmaceuticals website.

Courses

Students must be enrolled in the College of Pharmacy to enroll in professional-level (PharmD) coursework numbered 8000–9999. Students who meet prerequisite requirements may register for the college's undergraduate- and graduate-level courses numbered 1100–7999.

College of Pharmacy Courses

PHAR:1000 First-Year Seminar 1 s.h.
Small discussion class taught by a faculty member; topics chosen by instructor; may include outside activities (e.g., films, lectures, performances, readings, visits to research facilities).

PHAR:1100 Introduction to Pharmaceutical Sciences: Drug Development 1-2 s.h.
Introduction to drug discovery, development, and approval pathways used in the United States; specific focus on career pathways related to pharmaceutical development including the natural and biomedical sciences, clinical, regulatory and legal affairs, sales and marketing, and business development.

PHAR:1111 Need a New Drug? 1 s.h.
Introduction to drug discovery, development, and approval process in the United States; focus on preclinical and clinical development activities and role of the FDA and other regulatory bodies in approval and oversight of available drug products.

PHAR:1150 Emerging Perspectives in Pharmacy and the Pharmaceutical Industry 1 s.h.
Development of curiosity and knowledge of pharmacy practice, the pharmaceutical industry, and drug discovery. Students engage with emerging leaders from the University of Iowa College of Pharmacy Genesis Board. These recent graduates of the PharmD or PhD programs hold influential positions in pharmacy practice, the pharmaceutical industry, government, nonprofits, and innovative companies.

PHAR:1200 Medicines That Changed the World 1 s.h.
Herbal remedies and ancient traditional medicines have led to the discovery of life-saving drug therapies; as science has evolved, how the discovery of other important medicines have come about through advances in chemistry and biology and now through advances in computer science and informatics; students learn about the discovery history of some of the most important drug therapies of the 20th and 21st centuries and how those discoveries are leading to even more important, life-saving treatments.

PHAR:1300 Drugs and American Pop Culture 1 s.h.
Humans have used and misused drugs for thousands of years. Religious, cultural, and social experiences have been influenced by drugs. Review the roles of drugs in visual arts, literature, music, and film. Explore drug use and culture from the 1960s through the present day including the war on drugs and the social programs to combat addictions in America. Discuss the glamorization of drug use versus real-life impact of addictions. Drug names, chemical structure, classification, regulation, medicinal and recreational uses, and medications to assist with recovery will be reviewed.

PHAR:1812 What's in My Medicine Cabinet? An Introduction to Over-the-Counter Medications and Self Care 2 s.h.
Introduction to nonprescription medications for treatment of minor illness and health maintenance; causes, signs, and symptoms of common ailments with information about selection of appropriate over-the-counter therapies and considerations for the need for further care; self-care strategies for disease prevention and wellness.

PHAR:2000 Exploring Travel Medicine: Navigating Healthy Travel 2 s.h.
Introduction to international travel medicine including pre-assessments and planning, services provided to travelers to prevent and manage conditions during travel, and post-travel care.

PHAR:3994 Undergraduate Research in Pharmaceutical Sciences 1-4 s.h.
Individual scientific research conducted under the guidance of a faculty member.

PHAR:3995 Undergraduate Independent Study 1-4 s.h.
Supervised study. Requirements: enrollment in College of Pharmacy undergraduate certificate program.

PHAR:4146 Drug Disposition and Pharmacokinetics 2 s.h.
Introduction to drug absorption, distribution, and elimination processes controlling overall drug exposure in humans; basic quantitative measurements presented and used to demonstrate the influence of drug properties and physiologic action on drug disposition. Prerequisites: (MATH:1460 or MATH:1550 or MATH:1850) and (BIOL:1140 or BIOL:1141 or BIOL:1411 or BIOL:1412) and (STAT:1020 or PSQF:1020 or STAT:1030 or STAT:2010).

PHAR:4736 Properties of Dosage Forms I 3 s.h.
Introduction to principles of physical and chemical sciences important in drug product development; solubility, colligative properties, and partitioning behavior, as well as ionic equilibria, pH control, and chemical stability are evaluated in context of their importance in liquid dosage forms; emphasis on issues impacting drug product quality. Prerequisites: (CHEM:2220 or CHEM:2240) and (MATH:1460 or MATH:1550 or MATH:1850 or MATH:1860).

PHAR:4741 Immunology and Immunotherapies 2 s.h.
Introduction to basics of the immune system and how it protects against infection and disease; in-depth lectures on vaccines against infectious diseases and cancer in terms of their formulations and how they work; focus on past seminal findings, current treatment modalities, and cutting-edge technologies likely to impact future immunotherapeutic strategies.

PHAR:4799 Special Topics in Pharmaceutics arr.
Current topics in pharmaceutics. Prerequisites: MATH:2560 and CHEM:4431.

PHAR:4800 Chemical and Biophysical Properties of Drugs 2 s.h.
Introduction to design of drug molecules based on an understanding of drug-like properties including chemical reactivity and structural optimization; minimization of potentially toxic biotransformations; optimization of absorption; screening methods for selection and classification of optimized molecules. Prerequisites: ((CHEM:2220 or CHEM:2240) and BMB:3110) or (BMB:3120 and BMB:3130).

PHAR:4850 Upstream Biotechnology Processes 2 s.h.
Introduction to fermentation, fermenter preparation, cell growth and medium requirements, inoculation, sampling, process termination, separation of cells, fermentation case study, enzyme activity, and biocatalysis. Same as CHEM:4850.

PHAR:4851 Radiopharmaceuticals in Diagnostics and Therapy 2 s.h.
Use of radionuclides for diagnosis and monitoring of disease and in development of new therapeutic agents; strategies for provision of effective agents, regulatory processes, and safe handling and administration. Prerequisites: CHEM:2220 or CHEM:2240. Recommendations: one semester of physics, one semester of biology, one semester of anatomy or physiology, and one semester of pharmacology.

PHAR:5310 Health Services Research Seminar 1-2 s.h.
Recent research in pharmacy administration.

PHAR:5350 Introduction to Research Methods 3 s.h.
Scientific inquiry, experimental design, data collection, statistical methods used in the study of health services and clinical investigations; focus on understanding the research process and evaluating published studies. Recommendations: introductory statistics.

PHAR:5360 Applied Research Methods: Primary Data 2 s.h.
Advanced topics in research methods; focus on primary data collection and analysis; qualitative, mixed, survey, and intervention research methods with focus on applying these methods to topics in pharmacy health services research. Prerequisites: PHAR:5350.

PHAR:5365 Applied Research Methods: Secondary Data 2 s.h.
Advanced topics in research methods applicable to common sources of secondary data; hands-on experience writing programs to prepare and analyze various health-related data using common statistical software packages (e.g., SAS, STATA, R). Prerequisites: PHAR:5350.

PHAR:5400 Principles of Pharmacogenomics 3 s.h.
Fundamental knowledge of molecular biology and relationship to pharmacological agents; working knowledge of DNA, RNA, and protein changes that occur to influence gene expression; how pharmacological agents can impact biological mechanisms and how this can impact treatment response; requirements to design and carry out an experiment in human and animal models to study specific biological mechanisms; critical evaluation of published scientific literature to describe cutting-edge pharmacological findings in this field. Requirements: graduate standing in pharmacy (clinical pharmaceutical sciences, pharmaceutics, medicinal chemistry), neuroscience, pharmacology, or toxicology.

PHAR:5510 Pharmaceutical Sciences and Experimental Therapeutics Seminar 1-2 s.h.

PHAR:5512 Drug Discovery and Mechanisms 3 s.h.
Process of modern drug discovery, focus on high throughput screening strategies, target validation, pharmacological characterization of new compounds; mechanism of drugs targeting G protein coupled receptors, ion channels and transporters, targets in biological systems.

PHAR:5515 Perspectives in MNPC Research 2 s.h.
Contemporary research in medicinal chemistry and natural products.

PHAR:5520 Medicinal and Natural Products Chemistry Research arr.

PHAR:5537 Enzymatic Basis of Drug Metabolism 3 s.h.
Current literature on catalytic and physical properties, distribution, and substrate specificity of enzymes involved in mammalian drug metabolism. Prerequisites: CHEM:2220.

PHAR:5541 Total Synthesis of Biologically Active Natural Products 3 s.h.
Total synthesis of natural products; use of strategies and tactics for synthetic maneuvering; selectivity of important and complex medicinal compounds; modern chemical methods for construction of carbon-carbon bonds.

PHAR:5542 Molecular Recognition 1 s.h.
Focus on determinants in protein small molecule binding, particularly involving pharmaceutically relevant enzymes and receptors; how modern structure-based drug discovery is greatly aided by ability to employ protein structures in discovery and design of certain classes of drugs; structural approaches for predicting and improving drug affinity and selectivity, which have made a lasting impact across a number of diseases; important contemporary topics include in-depth lectures on fragment based drug discovery (FBDD), use and pitfalls of *in silico* docking and other screening methods, and emergence of covalent drugs. Requirements: introductory course in biochemistry. Same as BMB:5244.

PHAR:5545 Current Medicinal Chemistry 3 s.h.
Modern approaches to drug discovery with an emphasis on contemporary drug design and development. Course topics include, but are not limited to, driving factors for drug discovery and development in academia and the pharmaceutical industry; altering biological activity and biophysical properties of small molecules and biologicals through structural modification and conjugation; drug-target interactions and binding affinities; pharmacogenomics; bioconjugate chemistry; intellectual property topics and drug discovery and development; computational approaches and in silico resources for drug discovery and optimizing drug structures.

PHAR:5549 Analytical Biochemistry 3 s.h.
Application of modern chromatographic and detection methods used to isolate, characterize, and quantify drugs and macromolecules.

PHAR:5700 Quantitative Research Methods in Pharmacy I 3-4 s.h.
Collection and interpretation of analytical data; instrumental analysis and separation techniques.

PHAR:5720 Pharmaceutical Materials and Analysis 3 s.h.
Strong working knowledge in pharmaceutical solids; different types of solid phases, preparation, and methods of characterization in context of optimizing phase selection with respect to solubility, stability, and processability.

PHAR:5740 Drug Stability 2 s.h.
Principles of chemical and physical stability relevant to drug substances and various dosage forms. Key topics include mechanisms of instability, drug-excipient interactions, kinetics and stability testing, and shelf life predictions.

PHAR:5745 Advanced Biopharmaceutics and Drug Delivery arr.
Advanced design and development of drug delivery systems with emphasis on selection of materials and designs suitable for specific applications; comparison and evaluation of available and emerging technologies. Prerequisites: (BMB:3110 or BMB:3120) and (MATH:3600 or MATH:2560) and (CHEM:2220 or CHEM:2240) and PHAR:4736. Corequisites: PHAR:4146 (if not taken as a prerequisite). Requirements: one semester of human anatomy and physiology.

PHAR:5800 Concepts in Preclinical Drug Development 1 s.h.
Topics relevant to preclinical phase and early clinical stage of drug development; role of drug transporters in drug absorption, distribution, elimination; use of in vitro systems to evaluate drug metabolism, how to use in vitro metabolism data to predict drug clearance in humans; use of animal rule in drug development; biopharmaceutical classification system (BCS) and bioequivalence; biosimilar; use of minimum anticipated biological effect level (MABEL) to determine first-in-human (FIH) dose of protein drugs; drug-drug interaction including basic enzyme kinetics and inhibition (competitive, noncompetitive, uncompetitive); for students seeking to work in pharmaceutical industry.

PHAR:5875 Perspectives in Biotechnology 1 s.h.
Topics related to careers in biotechnology with an emphasis on preparing graduate students for careers outside of academia; discussions led by a series of guest speakers from leading biotech industries; understanding the societal impact of basic research; participation in round-table discussions; and presentation of student research findings. Requirements: graduate standing and good academic standing in a participating department supported by the Predoctoral Training Program in Biotechnology. Same as BMB:5875, CBE:5875, CEE:5875, CHEM:5875, MICR:5875.

PHAR:5880 Protein Pharmaceuticals 4 s.h.
Understanding the differences between proteins and small molecule therapeutics, protein structure and its characterization, manufacturing processes used for biological products, formulation and drug product development, stability issues, and more.

PHAR:6120 Clinical Pharmaceutical Sciences Research arr.

PHAR:6305 Foundation Literature in Health Services Research arr.
Issues related to pharmacy administration, social and behavioral pharmacy, pharmacy education.

PHAR:6320 Health Services Research arr.

PHAR:6330 Models of Patient Behavior and Choice 3 s.h.
Theoretical models used to describe behavior and choice in pharmaceutical socioeconomic research; models from economics, health services research, health behavior, clinical decision-making.

PHAR:6331 Models of Provider Behavior and Choice 3 s.h.
Theoretical background for study of provider decision-making and behavior; models based on a classic economic approach, models used to study provider behavior.

PHAR:6501 Principles and Mechanisms of Chemical Toxicology 3 s.h.
General principles and basic mechanisms of chemical and pharmaceutical toxicology; drug/toxicant disposition, including biotransformation and bioactivation to electrophiles.

PHAR:6504 Mastering Reproducible Science 1 s.h.
Training in methods for conducting rigorous and reproducible science; features an array of faculty who provide lectures and discussions based on their areas of expertise (i.e., research with animals, synthetic chemistry, high throughput screening, etc.) to provide broad exposure and training in these areas; critical evaluation of literature outside of student's own specific field of study.

PHAR:6515 Perspectives in Drug Discovery 1-2 s.h.
Contemporary research in drug discovery and experimental therapeutics.

PHAR:6700 Advanced Pharmacokinetics and Pharmacodynamics 3 s.h.
Application of pharmacokinetics and pharmacodynamics principles in pharmaceutical research. Prerequisites: PHAR:4146. Requirements: two semesters of calculus and one semester of statistics.

PHAR:6706 Equilibria Processes 3 s.h.
Equilibria pertaining to ionic systems, complexation, partitioning, solubility. Prerequisites: CHEM:2220 or CHEM:2240.

PHAR:6710 Pharmaceutics Graduate Seminar 1-2 s.h.

PHAR:6720 Pharmaceutics Research arr.

PHAR:6820 Drug Discovery and Experimental Therapeutics Research arr.
Participation in a variety of independent and supervised research projects required for doctoral degree in pharmacy.

PHAR:7101 Principles of Experimental Therapeutics 3 s.h.
Introduction to key principles and concepts for research in experimental therapeutics; basic principles related to drug disposition, toxicity, and efficacy.

PHAR:7102 Applied Clinical and Translational Science 3 s.h.
Application of clinical and translational science in a multidisciplinary collaborative environment to develop, conduct, and report research.

PHAR:7331 Analytic Issues in Health Services Research II 3 s.h.
Continuation of HMP:7960; advanced applications, including panel data and qualitative response models. Prerequisites: HMP:7960. Same as HMP:7965.

PHAR:7703 Transport Phenomena 3 s.h.
Diffusion and mass transport phenomena related to pharmaceutical systems.

PHAR:8130 Foundations of Pharmacy Practice I 4 s.h.
Introduction to contemporary pharmacy practice; small-group discussion, application of core concepts through active hands-on learning approaches; for first-year student pharmacists. Requirements: P1 standing.

PHAR:8131 Engagement: Professional Skills and Values 1 s.h.
Opportunity for student engagement in the College of Pharmacy prior to Professionalism Ceremony; development as a responsible partner in learning process by nurturing collaboration, leadership, service, compassion, community, self development, and social enrichment among students, faculty, and staff. Requirements: P1 standing.

PHAR:8132 Continuing Professional Development 1 s.h.
Engagement with profession of pharmacy and community through service and leadership activities, reflection; use of Continuous Professional Development Cycle (CPD) approach to learning. Requirements: P3 standing.

PHAR:8133 Introductory Pharmacy Practice Experience Career Exploration 1 s.h.
Hands-on exposure to various pharmacist career opportunities in four different pharmacy practice patient care settings; settings include practice areas and rotation types required for P4 Advanced Pharmacy Practice Experience (APPE) sites in community pharmacy, hospital pharmacy, ambulatory care/family practice, acute care medicine, and other elective practice settings; work with faculty mentor. Requirements: P1 standing.

PHAR:8134 Foundations of Health Services 3 s.h.
Foundation issues for pharmacist practice related to social, cultural, behavioral, economic, and organization design components of pharmacy care. Requirements: P1 standing.

PHAR:8135 Health Information Retrieval and Informatics 3 s.h.
Introduction and overview of health care information retrieval, organization, and dissemination; retrieval and organization of health information from pharmacy and medical primary and tertiary literature using secondary resources; knowledge and skills to manage, analyze, and legally share health information in electronic health records, pharmacy information systems, and automated systems. Requirements: P1 standing.

PHAR:8136 Foundations of Pharmaceutical Sciences 6 s.h.
Introduction and overview of foundations of pharmaceutical sciences. Requirements: P1 standing.

PHAR:8140 Foundations of Pharmacy Practice II 4 s.h.
Introduction to contemporary pharmacy practice for first-year student pharmacists; classroom methods include small group discussion-based and active hands-on learning approaches where students will apply core concepts.

PHAR:8148 Pharmacokinetics and Dose Optimization 2 s.h.

PHAR:8149 Foundations of Pharmacology and Toxicology 3 s.h.
Principles of pharmacology and toxicology.

PHAR:8150 Foundations of Health, Wellness, and Disease 2 s.h.
Overview of basic processes of good health and practices that promote wellness; emphasis on mechanistic causes of human disease.

PHAR:8151 Clinical Investigation I: Research Question, Study Design, and Methods 3 s.h.
Creation and dissemination of new knowledge related to pharmacy or health care; broadly based scholarly effort with topics ranging from patient case studies, literature reviews, and analysis of pharmacy practice problems or basic research. Requirements: P1 standing.

PHAR:8152 Fundamentals of Compounding 1 s.h.
Introduction to personalized drug delivery systems through the art of compounding. Requirements: P1 standing.

PHAR:8153 Integrated Pharmacotherapy: Dermatology and Sensory 2 s.h.
Key elements of science and practice of pharmacy presented in an integrated manner and focused on particular organ systems or disease states. Requirements: P1 standing.

PHAR:8207 Introductory Pharmacy Practice Experiences Community 3 s.h.
Exposure to the provision of care in a community pharmacy setting; activities focus on those experiences related to the community pharmacy environment, medication distribution, special products and populations, and related professional activities; delivered in set time blocks over winter break and during summer session before or after the P2 year.

PHAR:8209 Introductory Pharmacy Practice Experiences Hospital 3 s.h.
Exposure to the provision of care in a hospital pharmacy setting; activities focus on those experiences related to the hospital pharmacy environment, medication distribution, special products and populations, and related professional activities.

PHAR:8250 Applications of Pharmacy Practice I 2 s.h.
Expands on skills and concepts taught in the foundations of pharmacy practice course series and includes skills relevant to the disease states in the concurrent integrated pharmacotherapy courses; requires application of previously learned knowledge and skills to complex patient cases during Synthesis weeks; taught using a variety of classroom methods including small-group, discussion-based, and active hands-on learning approaches where students will apply core concepts. Requirements: P2 standing.

PHAR:8254 Integrated Pharmacotherapy: Endocrine 3 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states.

PHAR:8256 Integrated Pharmacotherapy: Renal, Fluids, and Electrolytes 2 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner; focus on particular organ systems or disease states.

PHAR:8260 Integrated Pharmacotherapy: Cardiovascular 4 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states.

PHAR:8261 Integrated Pharmacotherapy: Neurology and Psychiatry 4 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states.

PHAR:8263 Integrated Pharmacotherapy: Infectious Diseases 4 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states.

PHAR:8265 Applications of Pharmacy Practice II 2 s.h.
Expands on skills and concepts taught in the foundations of pharmacy practice course series and includes skills relevant to the disease states in the specific integrated pharmacotherapy courses; taught using a variety of classroom methods including small group, discussion-based, and active hands-on learning approaches where students apply core concepts.

PHAR:8275 Advanced Health Services 2 s.h.
Exploration of advanced topics in health service. Requirements: P2 standing.

PHAR:8276 Clinical Investigation II: Advanced Methods and Literature Interpretation 2 s.h.
Builds upon concepts in research methodology and study design introduced in PHAR:8151; advanced study designs with case examples will be discussed; students will learn the comparative strengths and weaknesses of different study designs to answer research questions and will develop evaluation skills necessary to critically interpret the findings of studies and apply results to patient care. Prerequisites: PHAR:8151. Requirements: P2 standing.

PHAR:8301 Introductory Pharmacy Practice Experience Clinical 1 s.h.
This third IPPE clinical is completed as an introduction to the Advanced Pharmacy Practice Experiences (APPE) to which student pharmacists are exposed during their P4 year; the IPPE clinical involves a P3 student observing and participating with a P4 student currently on an APPE rotation.

PHAR:8352 Integrated Pharmacotherapy: Musculoskeletal 4 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states. Requirements: P3 standing.

PHAR:8353 Integrated Pharmacotherapy: Genitourinary and Reproductive 2 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states. Requirements: P3 standing.

PHAR:8370 Integrated Pharmacotherapy: Respiratory and Allergy 2 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states.

PHAR:8371 Integrated Pharmacotherapy: Oncology and Hematology 2 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states.

PHAR:8372 Integrated Pharmacotherapy: Gastroenterology and Nutrition 3 s.h.
Key elements of the science and practice of pharmacy presented in an integrated manner focused on particular organ systems or disease states.

PHAR:8374 Applications of Pharmacy Practice III 2 s.h.
Expands on skills and concepts taught in the foundations of pharmacy practice course series and includes skills relevant to the disease states in the concurrent integrated pharmacotherapy courses; requires application of previously learned knowledge and skills to complex patient cases during Synthesis weeks; taught using a variety of classroom methods including small-group, discussion-based, and active hands-on learning approaches where students will apply core concepts.

PHAR:8378 Pharmacy Law and Ethics 2 s.h.
Topics include ethical behavior for pharmacists and student of pharmacy law.

PHAR:8384 Applications of Pharmacy Practice IV 1 s.h.
Expands on skills and concepts taught in the foundations of pharmacy practice course series and includes skills relevant to the disease states in the concurrent integrated pharmacotherapy courses; requires application of previously learned knowledge and skills to complex patient cases during synthesis weeks; taught using a variety of classroom methods including small-group, discussion-based, and active hands-on learning approaches where students will apply core concepts.

PHAR:8501 Introduction to Nuclear Pharmacy 2 s.h.
Nuclear pharmacy as a specialty area of pharmacy practice that involves preparation of radioactive materials for patient administration.

PHAR:8502 Advanced Pharmacopalliation of Pain 2 s.h.
Exploration of symptom management across the trajectory of serious illness through a series of longitudinal patient cases.

PHAR:8503 Advanced Pharmacopalliation of Non-Pain Symptoms 3 s.h.
Terminal extubation, terminal agitation, discontinuing life sustaining therapies, and pharmacokinetic and pharmaceutic issues in advanced illness.

PHAR:8505 Advanced Topics in Infectious Disease, HIV, and Antimicrobial Therapy 2 s.h.
Topics in antimicrobial treatment of infectious diseases beyond those in the required pharmacy curriculum, including topics covered in the infectious disease therapeutics course; lectures, case discussion, class participation, and summary presentations of an uncommon organism or antimicrobial agent.

PHAR:8509 Leaders Read: A Book Club Elective 2 s.h.
Introduction to concepts from *The Five Practices for Exemplary Leaders* by Kouzes and Posner; overview of all five practices with focus on first practice of "Modeling the Way;" values and skills of servant leadership through reading, reflection, and discussion; servant leadership philosophy where the main goal of the leader is to serve, and exploration of why servant leadership is critical; students articulate their own "why" and the importance of service in leadership.

PHAR:8510 Pediatric Elective 1 s.h.
Overview of pediatric developmental differences, disease state medication issues, and clinical decision skills specific to pediatric population. Requirements: P3 standing.

PHAR:8511 Introduction to Specialty Pharmacy 2 s.h.
Introduction to the rapidly growing field of specialty pharmacy; weekly interactive classes; students spend time in a specialty pharmacy environment and specialty clinic with a clinical pharmacy specialist to gain knowledge and understanding of clinical, business, distributive, and managed care aspects of specialty pharmacy. Requirements: P2 or P3 standing.

PHAR:8513 Advanced Literature Analysis and Evaluation 1 s.h.
Expansion of concepts introduced in first professional discovery course; improvement of knowledge and skills in practical evaluation of drug literature; emphasis on applied interpretation and application of study findings to patient care through active student journal club presentations and facilitation by faculty content experts. Prerequisites: PHAR:8276.

PHAR:8514 Clinical Toxicology 2 s.h.
Introduce students to topics in toxicology beyond those in the required pharmacy curriculum. Focus on developing students' basic understanding of drug mechanism of action, pharmacokinetic and pharmacodynamic changes associated with various toxicants, and the management of both pharmacologic and environmental toxicologic emergencies. Requirements: P2 standing.

PHAR:8515 Advanced Cardiotherapeutics 1 s.h.
Provide pharmacy students with a comprehensive understanding of cardiovascular diseases, their management, and the role of pharmacotherapy in optimizing patient outcomes. Students develop a strong foundation in cardiovascular pharmacology to gain the necessary skills to apply their knowledge in a clinical setting. Connect available primary literature evidence to tangible clinical decisions, weighing pros, cons, and potential clinical scenarios in which the clinical choice of therapy may change. Prerequisites: PHAR:8260. Requirements: P2 or P3 standing.

PHAR:8516 Advanced Pharmacopalliation 4 s.h.
Case-based, advanced pharmacotherapy course preparing student pharmacists with attitudes, knowledge, and skills to provide holistic, person-centered care for people with serious illnesses, with an exploration of symptom and medication management across pharmacy practice settings (e.g., community, inpatient, outpatient, transition of care, hospice). Requirements: P3 standing.

PHAR:8517 Fundamentals of Clinical Pharmacy for the Critically Ill 2 s.h.
Explores three core concepts as they relate to acute care clinical pharmacy practice: clinical skills, evidence-based practice, and communication and professionalism. Requirements: admission to the Certificate in Emergency Medicine and Critical Care Pharmacotherapy and P3 standing.

PHAR:8518 Innovating Healthcare: The Pharmacist Entrepreneur 2 s.h.
Introduction of key fundamentals and processes for starting a business or similar enterprise. From ideation to funding, operations, growth, and exit planning; students gain exposure to various real-world opportunities, challenges, and issues faced by entrepreneurs. Requirements: restricted to majors.

PHAR:8519 Pharmacy Calculations for NAPLEX-Readiness 2 s.h.
Overviews the calculations commonly used in pharmacy practice and assessed through the North American Pharmacist Licensure Examination (NAPLEX). Prepares students to apply calculation problem-solving skills to clinical practice; focuses on the pharmaceutical and clinical calculations critical to the safe and effective delivery of medications to the patient. Requirements: P2 or P3 standing.

PHAR:8706 Pharmacy Projects arr.
Basic and applied research problems of pharmaceutical interest.

PHAR:8707 Independent Study: Research arr.
Research projects working with collegiate faculty members.

PHAR:8708 Substances of Misuse 1 s.h.
Emphasis on the most important themes and concepts in the field of substance use and treatment; drugs of misuse including stimulants, opioids, sedative-hypnotics, alcohol, hallucinogens, marijuana, and performance enhancing compounds; drug use prevention and treatment; depiction of substance use in modern culture.

PHAR:8709 Pharmacist Role in Health Coaching and Nutrition 2 s.h.
Exploration of pharmacist role in health coaching and nutrition.

PHAR:8712 Nonprescription Pharmacotherapy and Self-Care 2 s.h.
Introduction to nonprescription medications; development of patient assessment and consultation skills; understanding of pharmacist's role in patient self-care. Requirements: P2 or P3 standing.

PHAR:8714 Independent Study: Academic arr.
Academic projects working with collegiate faculty members.

PHAR:8717 Ambulatory Care Pharmacy 2 s.h.
Additional experience in the practice of clinical pharmacy; focus on key therapeutic areas where ambulatory care clinical pharmacists currently have a significant impact improving patient care, including anticoagulation management, hyperlipidemia management, and diabetes management; opportunity to develop expertise in clinical decision-making, improve problem solving abilities, and continued development in writing and oral presentation skills. Requirements: P3 standing.

PHAR:8718 Special Topics in Acute Care 2 s.h.
Pharmacotherapy for common but varied inpatient medicine topics; review of disorder, therapeutic goals, treatment plans, patient education, monitoring; lecture or case-based classes; anticoagulation, hemostasis, diabetic ketoacidosis, ICU overview, hepatic failure, renal replacement therapies, ACLS, antimicrobial and antifungal selection, septic shock, cardiogenic shock, neurogenic shock and neuro/neurosurgical emergencies, burns, sedation.

PHAR:8721 Leadership and Advocacy arr.
Role of leadership and advocacy in shaping profession; promotes the development of advocacy and leadership skills essential to improve self, profession, and community. Requirements: P1, P2, or P3 standing.

PHAR:8724 Health System Pharmacy Practice Management 2 s.h.
Organizational structure of pharmacy departments in hospitals and health care systems; models for delivery of pharmaceutical care; pharmacy's role in drug policy decision-making; provision of drug information; clinical and distributive pharmacy services; control of pharmacy and pharmacy costs; use of information technology and automation for service delivery; supervisory management; quality improvement. Requirements: P2 or P3 standing.

PHAR:8790 Sustainable Clinical Pharmacy Services: Leadership, Management, and Implementation 1 s.h.
Practical knowledge and understanding of how to implement and sustain clinical pharmacy services in a variety of practice settings; how to identify outcomes to evaluate the success of ongoing services; students explore the perspective of leadership and management as it pertains to clinical pharmacy services.

PHAR:8793 Introduction to Global Health Studies 1 s.h.
Overview of topics pertaining to international health and cultural diversity in relation to pharmacy and global health; preparation for student pharmacists to become health care practitioners who optimize the health of patients and society; inspires students to advance the profession by fostering collaboration, global and public health leadership, professionalism and civic engagement; introduction and discussion of important topics in global health, focusing specifically on care of the underserved in a global context.

PHAR:8794 Emergency Medicine 2 s.h.
Overview and discussion of pathology and pharmacotherapy in emergency medicine.

PHAR:8795 More than Medications: Healthcare for the Whole Patient 2 s.h.
Explore the principles and practice of providing whole-person healthcare. Whole-person care is the integration of a variety of resources to support a patient's mind, body, and spirit in their healthcare journey. Additional topics to be covered include interprofessional care teams, palliative care as a public health need, communication strategies, and self-care.

PHAR:8796 Introduction to Travel Medicine 2 s.h.
Overview of services provided to travelers to prevent and management conditions that may arise prior to, during, and after international travel; students learn about topics pertaining to each of these areas.

PHAR:8797 Well-Being and Ethics in Healthcare 3 s.h.
Explore the relationship between the ethical provision of healthcare and the well-being of people living with serious illness and their care team, including healthcare providers, caregivers, and family; prepares students to identify and approach potential challenges and threats to well-being they may face in their personal or professional life. Topics explored via discussion, reflection, and examining multimedia sources include ethics and laws pertaining to living, receiving medical care, and dying; suffering, dignity, and grieving; cultural and spiritual contexts of illness and death; health equity in serious illness care; moral distress; and compassion fatigue. Requirements: P2 or P3 standing.

PHAR:8798 Continuing Professional Development in Palliative Care 1 s.h.
Self-directed learning and development in palliative care; creation and implementation of a professional development plan including activities in service, scholarship and education, leadership and advocacy, and self-care and personal resilience.

PHAR:8799 Active Residency Preparation 2 s.h.
Students develop the best understanding of what a residency is, what programs exist, the usual qualifications for placement, and the necessary pathway and components of residency attainment; hands-on experience with preparation process; for pharmacy students interested in pursuing residency training following graduation. Requirements: P3 standing.

PHAR:9401 Ambulatory Care Rotation 6 s.h.
Clinical experience in providing pharmaceutical care in outpatient clinic settings. Requirements: P4 standing.

PHAR:9404 Community Clinical Rotation 6 s.h.
Clinical experience in the community setting; emphasis on delivery of pharmaceutical care. Requirements: P4 standing.

PHAR:9410 Hospital Pharmacy Rotation 6 s.h.
Instruction and practical experience in various components of hospital pharmacy; emphasis on hospital organization, inpatient and outpatient services, IV admixtures, unit dose, and clinical services. Requirements: P4 standing.

PHAR:9413 Acute Care Medicine Rotation 6 s.h.
Clinical experience applying therapeutic skills for the pharmacotherapeutic management of patients on general medicine or specialty inpatient areas. Requirements: P4 standing.

PHAR:9435 Administrative Bye Rotation 6 s.h.

PHAR:9450 Elective: Patient Care Rotation 6 s.h.
Elective pharmacy practice experiences providing direct patient-centered care in a variety of settings aimed at personalizing student educational interests and career goals. Requirements: P4 standing.

PHAR:9451 Elective: Non-Patient Care Rotation 6 s.h.
Elective pharmacy practice experiences in unique nonpatient-facing practice settings aimed at personalizing student educational interests and career goals. Requirements: P4 standing.