College of Pharmacy

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Head, health services research
• William R. Doucette

Head, medicinal and natural products chemistry
• Jonathan A. Doorn

Head, pharmaceutics and translational therapeutics
• Aliasger K. Salem

Director, University of Iowa Pharmaceuticals
• Mickey L. Wells

Professional degree: Pharm.D.
Graduate degrees: M.S. in pharmacy; Ph.D in pharmacy
Faculty: http://pharmacy.uiowa.edu/directory/faculty
Web site: http://pharmacy.uiowa.edu/

The pharmacy profession is concerned with a wide variety of activities, from developing new drug products to caring for patients. An important concept in the delivery of pharmacy services is medication therapy management—the responsible provision of drug therapy to achieve defined outcomes that improve patients’ quality of life. These outcomes include preventing, arresting, or curing a disease, and/or eliminating or reducing its symptoms.

In order to carry out these activities, pharmacists specialize in the science of drugs and drug information.

The dispensing of medications and information at the corner pharmacy is just one aspect of the profession. Pharmacists work in many health care settings, engaging in research, clinical practice, teaching, and counseling. Along with their training in science and drug preparation, they learn the business and communication skills necessary for their multifaceted careers.

Demand for qualified pharmacists is high. Iowa's pharmacy students study with professors who, in many cases, are pioneering the development of new drugs and are defining the appropriate use of others to solve chronic health problems. They also enjoy advanced research facilities, including those of Iowa's drug research and manufacturing area, where experimental drugs are produced for testing and licensing by manufacturers before being introduced worldwide.

The University of Iowa College of Pharmacy is accredited by the Accreditation Council for Pharmacy Education.

College Organization

The College of Pharmacy's faculty and programs are organized in two academic departments, each with two divisions. These units provide course work for the Doctor of Pharmacy curriculum and for the college's graduate programs.

PHARMACY PRACTICE AND SCIENCE DEPARTMENT

Faculty in the Pharmacy Practice and Science Department 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; and provide instruction in the pharmacist's professional role and the safe, effective use of medications.

The department offers Master of Science and Doctor of Philosophy curricula in pharmaceutical socioeconomics, which encompasses the behavioral, economic, social, and administrative sciences; elements of pharmacy practice; and health services research. It offers course work through its Applied Clinical Sciences Division and its Health Services Research Division.

Applied Clinical Sciences 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 pharmaco therapy, 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 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 on 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 the Pharmacy Practice and Science web site.

**PHARMACEUTICAL SCIENCES AND EXPERIMENTAL THERAPEUTICS DEPARTMENT**

Faculty in the Pharmaceutical Sciences and Experimental Therapeutics Department provide expertise and education in clinical pharmaceutical sciences, medicinal and natural products chemistry, and pharmaceutics. Their interests include dosage form development and performance, industrial and manufacturing pharmacy, pharmacokinetics and pharmacodynamics, and the chemistry of drugs and their action on human systems. The department offers courses through its Medicinal and Natural Products Chemistry Division and its Pharmaceutics and Translational Therapeutics Division.

**Medicinal and Natural Products Chemistry Division:** Course work in this division relates to understanding the chemistry of drugs and their action on human systems, principles of drug discovery and drug design, natural product chemistry, and biotechnology and genomic strategies for producing new drug molecules. The division’s curricula for the M.S. and Ph.D. programs provide abundant opportunities for interface with researchers in other areas, including medicine, pharmacology, biochemistry, chemistry, and pharmaceutics.

**Pharmaceutics and Translational Therapeutics Division:** This division prepares students to become leaders in developing and evaluating drugs, drug products, and drug delivery systems. It offers two M.S. and Ph.D. subtracks: the pharmaceutics subtrack, which focuses on characterization of pharmaceuticals and their component materials, development of delivery systems for optimal human or veterinary use, and the pharmacokinetic and pharmacodynamic evaluation of drug actions and interactions; and the clinical pharmaceutical sciences subtrack, which focuses on investigating drug therapy outcomes in patients and identifying factors responsible for specific drug actions in individual patients, related patient groups, and large patient populations. The division also offers multidisciplinary opportunities with programs in chemistry, engineering, biomedical science, dentistry, and veterinary medicine. Its national and international collaborations enhance the breadth of research activities available to students.

To learn more about the divisions, visit the Medicinal and Natural Products Chemistry and Pharmaceutics and Translational Therapeutics web sites.

**Professional Program of Study (Pharm.D.)**

- Doctor of Pharmacy

The College of Pharmacy collaborates with the College of Public Health to offer the joint Master of Public Health/Doctor of Pharmacy (M.P.H./Pharm.D.) program.

**Doctor of Pharmacy**

The Doctor of Pharmacy program requires 151 s.h. of professional program credit. The program prepares students for careers in pharmacy. It provides professional education in a number of areas, including pharmaceutical technology, biopharmaceutics, medicinal chemistry and natural products, pharmaceutical socioeconomics, pharmacotherapy, patient care, clinical and hospital pharmacy, and aspects of biotechnology. Graduates of the program are qualified to take the Iowa Board of Pharmacy examination that is required for licensure as a pharmacist.

The program requires four years of full-time pharmacy study preceded by at least two years of pre-pharmacy study in the College of Liberal Arts and Sciences at the University of Iowa or at an accredited community or liberal arts college in the United States or Canada.

During pre-pharmacy study, students complete the prerequisites to admission to the Pharm.D. program (see "Admission" below for a list of prerequisite course work). Pharm.D. students complete a total of 20 s.h. of general education course work. They complete 12 s.h. of general education courses as part of their pre-pharmacy study, but if possible, they should complete all 20 s.h. of their general education work before they enter the Pharm.D. program. Courses in moral reasoning or ethics, communication, computer science, and business are recommended for general education; courses in behavioral and social sciences and the humanities are accepted. Courses in physical education skills, applied music, and studio art do not count toward the general education requirement.

Pharm.D. students must maintain a cumulative g.p.a. of at least 2.00 and a pharmacy g.p.a. of at least 2.00. The pharmacy grade-point average is computed from grades earned in all required courses that students have completed while enrolled in the College of Pharmacy, excluding general education courses and professional electives.

Students must earn a grade of C-minus or higher in transfer courses applied to the Pharm.D.

For rules and regulations concerning academic probation, pass/nonpass, credit by examination, maximum schedule, second-grade-only option, waiver or substitution of courses, cancellation of registration, drop date, and Guided Independent Study, see Student Resources on the College of Pharmacy web site.

The Tippie College of Business, the Carver College of Medicine, the College of Dentistry, and the College of Liberal Arts and Sciences contribute to the education of pharmacy students by providing instruction in the physical sciences, basic medical sciences, business, the humanities, and the social sciences.

The College of Pharmacy provides students with the highest possible quality in the professional experiential program. Faculty and adjunct faculty serve as preceptors, providing introductory and advanced practice experience at institutions and pharmacies in Iowa, nationwide, and around the world.

**Professional Curriculum**

The Pharm.D. degree requires the course work listed below, including at least 12 s.h. of professional electives. In addition, students must complete all prerequisites to admission to the Pharm.D. program, including 12 s.h. of general education courses chosen from behavioral, social, humanistic, and business disciplines (see "Admission" below). They also must complete an additional 8 s.h. of
general education work either before or after admission to the Pharm.D. program.

**FIRST YEAR**
Students must complete one semester of PHAR:8100 Introduction to Pharmacy Practice during the first professional year. They also complete PHAR:8205 Student Pharmacist Professionalism throughout the first, second, and third professional years.

**First Semester**
- PHAR:8100 Introduction to Pharmacy Practice 1 s.h.
- PHAR:8101 Pharmacy Practice Lab I 2 s.h.
- PHAR:8103 Fundamentals of Evaluating Clinical Research 1 s.h.
- PHAR:8111 Pharmaceutics I: Solutions 4 s.h.
- PATH:8133 Introduction to Human Pathology for Graduate Students 4 s.h.

**Second Semester**
- PHAR:8100 Introduction to Pharmacy Practice (if not taken first semester) 1 s.h.
- PHAR:8102 Pharmacy Practice Lab II 2 s.h.
- PHAR:8105 Social Aspects of Pharmacy Care 2 s.h.
- PHAR:8112 Pharmaceutics II: Solids and Semi-Solids 4 s.h.
- PHAR:8121 Medicinal and Natural Products Chemistry I: Biotechnology and Chemotherapy 3 s.h.
- PCOL:8180 Pharmacology for Pharmacy Students I 3 s.h.

**SECOND YEAR**
Students must complete PHAR:8200 Introduction to Community Pharmacy Practice and PHAR:8206 Introduction to Hospital Pharmacy Practice during the second professional year. These practice experiences are delivered in set time blocks over the winter break or during the summer before or after the P2 year.

**First Semester**
- PHAR:8200 Introduction to Community Pharmacy Practice 3 s.h.
- PHAR:8206 Introduction to Hospital Pharmacy Practice 3 s.h.
- PHAR:8203 Pharmacy Practice Lab III 2 s.h.
- PHAR:8213 Pharmacokinetics and Biopharmaceutics 3 s.h.
- PHAR:8240 Introduction to Therapeutics/ Special Populations 2 s.h.
- PHAR:8241 Endocrinology, Ophthalmology, Women's and Men's Health Therapeutics 2 s.h.
- PCOL:8181 Pharmacology for Pharmacy Students II 3 s.h.

**Second Semester**
- PHAR:8201 Clinical Practice Skills I: Theory and Application 2 s.h.
- PHAR:8204 Pharmacy Practice Lab IV 2 s.h.
- PHAR:8206 Introduction to Hospital Pharmacy Practice 2 s.h.
- PHAR:8213 Medicinal and Natural Products Chemistry III: Medicinal Neurochemistry 3 s.h.
- PHAR:8230 Clinical Pharmacokinetics 3 s.h.
- PHAR:8242 Respiratory and Dermatologic Therapeutics 2 s.h.
- PHAR:8243 Cardiovascular Therapeutics 2 s.h.
- Professional electives 3 s.h.

**THIRD YEAR**
Students must complete one semester of PHAR:8300 Introduction to Clinical Pharmacy Practice during the third professional year.

**First Semester**
- PHAR:8300 Introduction to Clinical Pharmacy Practice (may be taken either fall or spring semester) 1 s.h.
- PHAR:8302 Clinical Practice Skills II: Critical Patient Analysis 2 s.h.
- PHAR:8305 Pharmacy Practice Lab V 2 s.h.
- PHAR:8308 Pharmaceutical Economics and Insurance 3 s.h.
- PHAR:8313 Drug Literature Evaluation 2 s.h.
- PHAR:8340 FEN, GI, and Renal Therapeutics 2 s.h.
- PHAR:8341 Rheumatology, Immunology, Hematology, Oncology, and Transplantation Therapeutics 2 s.h.
- Professional electives 4 s.h.

**Second Semester**
- PHAR:8104 Pharmacy Law and Ethics 2 s.h.
- PHAR:8205 Student Pharmacist Professionalism 1 s.h.
- PHAR:8303 Clinical Practice Skills III: Applied Patient Management 2 s.h.
- PHAR:8306 Pharmacy Practice Lab VI 2 s.h.
- PHAR:8309 Pharmacy Management and Marketing 2 s.h.
- PHAR:8342 Neurology/Psychiatry Therapeutics 2 s.h.
- PHAR:8343 Infectious Disease Therapeutics 2 s.h.
- Professional electives 5 s.h.

**FOURTH YEAR: ADVANCED PHARMACY PRACTICE ROTATIONS**
During the fourth year, students are required to complete eight advanced pharmacy practice rotations. All students must complete the first four rotations listed below (24 s.h.); they also must complete an additional four rotations of their choice (24 s.h.).

All of these (24 s.h.):
- PHAR:9401 Ambulatory Care Rotation 6 s.h.
- PHAR:9404 Community Pharmaceutical Care Rotation 6 s.h.
- PHAR:9410 Hospital Pharmacy Rotation 6 s.h.
- PHAR:9413 Acute Care Medicine Rotation 6 s.h.

Four of these (24 s.h.):
- PHAR:9402 Elective Ambulatory Care Rotation 6 s.h.
- PHAR:9403 Elective Nuclear Pharmacy Rotation 6 s.h.
- PHAR:9406 Elective: Drug Information Rotation 6 s.h.
- PHAR:9407 Elective Family Medicine Rotation 6 s.h.
PHAR:9408 Elective Hematology/Oncology Rotation 6 s.h.
PHAR:9409 Elective Home Health Care Rotation 6 s.h.
PHAR:9411 Elective Long Term Care Rotation 6 s.h.
PHAR:9412 Elective Managed Care Rotation 6 s.h.
PHAR:9414 Elective Neurology Rotation 6 s.h.
PHAR:9415 Elective: Pediatrics Rotation 6 s.h.
PHAR:9416 Elective: Pharmacy Rotation 6 s.h.
PHAR:9417 Elective Psychiatry Rotation 6 s.h.
PHAR:9418 Elective Research Rotation 6 s.h.
PHAR:9419 Elective: Surgery Rotation 6 s.h.
PHAR:9420 Elective Pharmacy Practice Under served Population Rotation 6 s.h.
PHAR:9422 Elective: Compounding/Complimentary Alternative Medicine Rotation 6 s.h.
PHAR:9423 Elective: Critical Care Medicine Rotation 6 s.h.
PHAR:9424 Elective Emergency Medicine Rotation 6 s.h.
PHAR:9425 Elective Hospital Management Rotation 6 s.h.
PHAR:9426 Elective Infectious Disease Rotation 6 s.h.
PHAR:9427 Elective Medication Use Evaluation Rotation 6 s.h.
PHAR:9428 Elective Pharmacy Industry Rotation 6 s.h.
PHAR:9429 Elective: Pharmacy Regulatory Rotation 6 s.h.
PHAR:9430 Elective: Professional Association Rotation 6 s.h.
PHAR:9431 Elective: Veterinary Pharmacy Rotation 6 s.h.
PHAR:9432 Elective: Advanced Community Pharmacy Rotation 6 s.h.
PHAR:9433 Elective Academic Rotation 6 s.h.

**PROFESSIONAL ELECTIVES**

Pharm D. students must complete 12 s.h. of professional electives, which they may choose from the following list.

PHAR:3740 End-of-Life Care for Adults and Families 2-4 s.h.
PHAR:3745 Drug Delivery I 2 s.h.
PHAR:3746 Drug Delivery II arr.
PHAR:5515 Perspectives in MNPC Research 1 s.h.
PHAR:8702 Dean's Pharmacy Forum II 2 s.h.
PHAR:8703 Web 2.0 and Pharmacy Drug Information 2 s.h.
PHAR:8706 Pharmacy Projects 1-3 s.h.
PHAR:8708 Substance Abuse 2 s.h.
PHAR:8710 Introduction to Pharmacogenomics 2 s.h.
PHAR:8712 Nonprescription Pharmacotherapy 2 s.h.
PHAR:8715 Health Disparities and Cultural Competence 2-4 s.h.
PHAR:8717 Ambulatory Care Pharmacy 2 s.h.
PHAR:8718 Special Topics in Acute Care 2 s.h.
PHAR:8719 Overview of Pediatric Pharmacotherapy 2 s.h.
PHAR:8720 Health Coaching and Wellness 2 s.h.

PHAR:8721 Leadership and Political Advocacy arr.
PHAR:8722 Current Topics in Health Policy 2 s.h.
PHAR:8724 Hospital Pharmacy Practice Management Elective
PHAR:8725 Career Pathways in Pharmacy 1 s.h.
PHAR:8788 International Perspectives: Xicotepec 2 s.h.
PHAR:8790 Topics in Community Pharmacy Management 2 s.h.
PHAR:8791 Survey of Basic Pharmaceutical Sciences 1 s.h.

**Joint M.P.H./Pharm.D.**

The College of Pharmacy and the College of Public Health offer the joint Master of Public Health/Doctor of Pharmacy program. The joint M.P.H./Pharm.D. requires 42 s.h. of graduate credit in addition to the requirements of the Pharm.D. degree. Students who complete the program are granted both degrees.

The M.P.H./Pharm.D. program helps students develop expertise in public health related to pharmacotherapy, health promotion, disease prevention, and medication safety. Its graduates may work in areas of interest common to pharmacy and public health, such as spread and treatment of disease, community health, and immunology; bioterrorism, terrorism, and preparedness; genetics; insurance; managed care; family and juvenile health; and protection of special populations. Employment opportunities are available in hospitals and clinics and with health care providers; private practice; insurance and managed care organizations; local, county, state, and federal government; public health governmental agencies; and colleges and universities.

Separate admission to each degree program is required. Applicants must be admitted to both programs before they may be admitted to the joint degree program.

See "Joint M.P.H./Pharm.D." in the Master of Public Health Program section of the Catalog to learn about curriculum and admission requirements for the joint program.

**Admission**

Individuals apply to the Pharm.D. program using PharmCAS, the American Association of College of Pharmacy application service. Applicants also must submit a supplemental application, including a $100 application fee, to the University of Iowa College of Pharmacy; see Iowa Graduate Admissions—College of Pharmacy for more information.

All application materials must be received by December 1 of the year before the applicant intends to enter the College of Pharmacy. Entry is for fall semester.

All Pharm.D. applicants must take the Pharmacy College Admission Test (PCAT); they must take PCAT before December 31 of the year before they wish to enter the College of Pharmacy in order to be considered by the admissions committee.

Applicants must complete the college-level work listed under "Prerequisites to Admission to the Pharm.D. Program" below. They also must have an overall cumulative g.p.a. of at least 2.50 and must submit two letters of recommendation. Applicants considered for
admission must have a personal interview; the college contacts applicants to arrange interview appointments.

Fulfillment of the admission requirements listed above does not ensure admission to the College of Pharmacy. The admissions committee considers applicants who meet these requirements and selects individuals who, in their judgment, appear to be best qualified for the study and practice of pharmacy.

Applicants who are accepted for admission are required to submit to a criminal background check and pay a $250 admission acceptance fee. The fee is applied to tuition for the student's first semester of enrollment in the college. The deposit is not refunded to applicants who do not enroll in the College of Pharmacy.

Entering health sciences students are required to have an annual tuberculin skin test (TST) and proof of immunization against mumps, measles and rubella (2 MMRs), tetanus, diphtheria and varicella before classes begin. The usual regimen of three doses of Hepatitis B vaccine and a Hepatitis B titre must be completed by the second semester of the first year. All students are required to have hospitalization and health insurance.

**PREREQUISITES FOR ADMISSION TO THE PHARM.D. PROGRAM**

Applicants to the Pharm.D. program must have completed the following college-level work.

- **Rhetoric:** 4 s.h. (RHET:1030 Rhetoric) or 6 s.h. of transfer credit in English composition and rhetoric and 3 s.h. in speech
- **Human anatomy:** 3 s.h. (ACB:3110 Principles of Human Anatomy)
- **General biology:** 8 s.h. (BIOL:1411 Foundations of Biology and BIOL:1412 Diversity of Form and Function)
- **General chemistry:** 8 s.h. (CHEM:1110 Principles of Chemistry I and CHEM:1120 Principles of Chemistry II)
- **Organic chemistry:** 6 s.h. (CHEM:2210 Organic Chemistry I and CHEM:2220 Organic Chemistry II)
- **Mathematics:** 3-4 s.h. of a satisfactory differential and integral calculus course (MATH:1460 Calculus for the Biological Sciences)
- **Microbiology:** 4 s.h. (MICR:3112 Pharmacy Microbiology)
- **Microeconomics:** 3-4 s.h. (ECON:1100 Principles of Microeconomics)
- **Physics:** one year of high school physics or one semester of college-level physics with a lab (PHYS:1400 Basic Physics)
- **Human physiology:** 3 s.h. (HHP:3500 Human Physiology)
- **Statistics:** 3 s.h.

**General education electives:** at least 12 s.h.

Courses in moral reasoning or ethics, communications, computer science, and business are recommended for general education; courses in the behavioral and social sciences and the humanities are accepted. Courses in physical education skills, applied music, and studio art do not count toward the general education requirement.

**Financial Support**

All second-, third-, and fourth-year pharmacy students are encouraged to apply for College of Pharmacy scholarships. Applications are available each April from the College of Pharmacy Office of Academic Affairs. Students complete a single application form in order to be considered for all scholarships. Award amounts vary. The Awards and Recognition Committee selects the best-qualified applicant for each scholarship.

- **Steve and Teresa Berge Scholarship:** for a pharmacy student who is a U.S. citizen and has a g.p.a. of at least 3.00; experience doing volunteer work highly desirable.
- **Seymour M. Blaug Memorial Award:** for a pharmacy student with above-average academic achievement.
- **Dennis and Bev Bousselet Scholarship:** for a pharmacy student who maintains satisfactory academic progress; nonrenewable, financial need is considered.
- **Burroughs-Wellcome Scholarship Fund:** for a student of the committee's choice.
- **David and James Carlson Scholarship:** for two pharmacy students interested in clinical or hospital practice; preference given to students from north of U.S. Interstate 80 and west of U.S. Interstate 35 who show financial need.
- **Todd and Jody Christiansen Scholarship Fund:** for a pharmacy student who is enrolled in a dual degree or certificate program; shows financial need and academically strong.
- **Class of 2009 Award:** qualifications vary.
- **Jordan and Jana Cohen Doctor of Pharmacy Scholarship:** for a pharmacy student in good academic standing; based on merit and need; renewable.
- **College of Pharmacy Executive Leadership Board Excellence Fund:** for the senior class president and/or qualifications vary.
- **Vernon Conzemius Scholarship:** for a pharmacy student who demonstrates financial need; preference is given to students in the upper half of their class.
- **CVS Scholarships:** for two pharmacy students in good academic standing who are interested in community pharmacy.
- **John and Margo Daniel Scholarship:** preference is given to a student from Webster County, Iowa.
- **Max Eggleston Scholarship:** for a student who has completed one year; preference is given to students from Iowa; based on financial need.
- **Alice Gates Coxon Memorial Scholarship:** for a student in good academic standing; essay required.
- **Lori A. Grimes Memorial Scholarship:** based on financial need; renewable.
- **Dick and Brenda Hartig Scholarship:** for a student who demonstrates financial need; preference is given to students from Dubuque, Waukon, Dyersville, and Iowa City, Iowa; and Galena and Stockton, Illinois.
Thomas D. Hill Scholarship: for a pharmacy student in good academic standing.

Janet Hinderliter Scholarship: for a P3 or P4 student with a g.p.a. of at least 3.00 and demonstrated involvement in campus and community affairs.

Frances T. and Charles Holub Memorial Award: for a third-year pharmacy student; financial need is considered; renewable once.

Iowa Pharmacy Foundation Scholarships: for selected pharmacy students who are residents of Iowa and who demonstrate outstanding academic ability; financial need is considered (Eggleston-Granberg Scholarship is awarded from this fund).

R.A. Kuever Scholarship Fund: for a pharmacy student from Iowa who is in good academic standing.

Ernest Kyle Memorial Scholarship: for a student of the committee's choice.

Ronald Madden Scholarship: for an Iowa high school graduate in good academic standing.

Charles J. Malecek Pharmacy Scholarship: for a student of the committee's choice.

Virgil R. McCutchan Memorial Scholarship: for a deserving pharmacy student.

Carleton Mikkelsen Scholarship: for the top P4 student based on final P3 grade-point average; in case of a tie, the committee chooses the recipient.

Miller-Ruegnitz Scholarships: based on financial need, non-renewable.

NACDS Scholarship: for a student interested in community pharmacy.

Petersen Linder Scholarship: for a pharmacy student in excellent academic standing who has outstanding leadership skills; based on financial need.

Pharmacists Mutual Scholarship: for a student of the committee's choice.

Pharmacy Student Aid Scholarship: for a student of the committee's choice.

Quad Cities Area Pharmacists Association Scholarships: for students who demonstrate financial need; preferably one student from Iowa and one from Illinois.

Robert E. and Barbara J. Rehal Family Scholarship: for a student who has interest in independent or community pharmacy; preferably from Sioux City, Iowa.

Sattler Family Scholarship: for a student of the committee's choice, alternates with the Carver College of Medicine.

Hal Schimmelpfenning Scholarship Fund: for a pharmacy student from Sigourney, Iowa.

Scherling Scholarship: for a student who demonstrates superior academic achievement in organic chemistry.

Chuck and Jacqueline Schwenke Scholarship: for a student of the committee's choice.

Gordon H. Sheffield Scholarship: for a P3 or P4 student from Iowa; preference given to a student who demonstrates leadership and financial need.

ShopKo Scholarship: preference given to students who reside or have resided in a state where Shopko is located.

Shutt Pharmacy Scholarship: preference is given to Iowa residents; based on financial need.

H. Curtis Snyder Award: for a pharmacy student in good standing.

Paul G. and Vivian Soderdahl: for a student of the committee's choice.

Wilber J. Teeters and the Teeters/Wahl Scholarships: for a pharmacy student who has completed at least one year in the college; financial need is considered.

Thompson Scholarship Fund in Memory of Rob Chabal: preference given to a fourth-year student committed to community pharmacy practice.

John S. Thor (Nash) Scholarship Fund: for a pharmacy student in good standing; renewable.

Colonel Thomas C. Veach Class of 1952 Scholarship Fund: preference given to a student interested in compounding or industrial pharmacy.

Walgreens Diversity Scholarship: for a student who has made significant efforts toward raising awareness about matters of diversity that affect the pharmacy profession.

Wal-Mart Scholarship: for a P3 or P4 student with high scholastic standing who demonstrates strong leadership, desire to enter a community pharmacy practice, and financial need.

Jo H. and Robert A. Wiley Scholarship Fund: for a pharmacy student who is an Iowa native and shows financial need.

Louis C. Zopf Memorial Award: for a pharmacy student in good standing.

Robert E. and Barbara J. Rehal Family Scholarship: for a student who has interest in independent or community pharmacy; preferably from Sioux City, Iowa.

Sattler Family Scholarship: for a student of the committee's choice, alternates with the Carver College of Medicine.

Hal Schimmelpfenning Scholarship Fund: for a pharmacy student from Sigourney, Iowa.

Scherling Scholarship: for a student who demonstrates superior academic achievement in organic chemistry.

Chuck and Jacqueline Schwenke Scholarship: for a student of the committee's choice.

Gordon H. Sheffield Scholarship: for a P3 or P4 student from Iowa; preference given to a student who demonstrates leadership and financial need.

Graduate Programs of Study

- Master of Science in pharmacy
- Doctor of Philosophy in pharmacy

The College of Pharmacy offers graduate programs in four areas: clinical pharmaceutical sciences, medicinal and natural products chemistry, pharmaceutical socioeconomics, and pharmaceutics.

Advanced study in the pharmaceutical sciences prepares students for research, teaching, and administrative positions in the pharmaceutical industry, in colleges and universities, in government agencies, and in health-related institutions and organizations.

Applicants must meet the admission requirements of the Graduate College; see the Manual of Rules and Regulations of the Graduate College. Academic requirements for maintaining graduate registration are determined by the Graduate College and by the individual divisions of the College of Pharmacy.

For more information about graduate study, visit the College of Pharmacy web site.
Facilities and Resources

Pharmacy Building

The Pharmacy Building is located on the University's health sciences campus, in close proximity to the Carver College of Medicine, College of Dentistry, College of Nursing, and College of Public Health. Also nearby are University of Iowa Hospitals and Clinics, the Bowen Science Building, and the Hardin Library for the Health Sciences.

The Pharmacy Building is a five-story structure designed to provide modern facilities for a comprehensive program of pharmacy education. In addition to classrooms and auditoriums, there are well-equipped separate laboratories for instruction at the professional and graduate levels.

The college operates small and large classrooms with state-of-the-art technology. The student practice lab is a technologically advanced licensed pharmacy that provides real and simulated practice experiences. The Banker Student Activity Center provides quiet individual and small-group study environments and houses offices for College of Pharmacy Student Organizations.

The building also houses a fully supported Instructional Technology Center (Pharmacy ITC) in the Learning Resource Center. The ITC provides state-of-the-art desktop workstations and laptop computers are available for student checkout. Both desktop and laptop computers have secure connections to the University network for online drug information searching and printing.

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 pharmacists faculty members to produce virtually every type of pharmaceutical dosage form, supplying new pharmaceutical agents for use in clinical trials and other research. The facility combines the former Center for Advanced Drug Development and Division of Pharmaceutical Service. For more information, visit the University of Iowa Pharmaceuticals web site.

Courses

Students must be enrolled in the College of Pharmacy to take the college's courses. Undergraduate and graduate students in other colleges must have the instructor's consent to take College of Pharmacy courses.

Lower-Level Undergraduate

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 1 s.h.

Upper-Level Undergraduate and Graduate

PHAR:3745 Drug Delivery I arr.
Advanced design and development of drug delivery systems; emphasis on selection of materials and designs suitable for specific applications; comparison and evaluation of available and emerging technologies. Requirements: introductory-level courses in biochemistry and anatomy/physiology.

PHAR:3746 Drug Delivery II arr.
Continuation of PHAR:3745. Prerequisites: PHAR:3745.

PHAR:4740 Materials in Drug and Gene Delivery 3 s.h.
Different types of materials used in drug and gene delivery including synthetic and natural polymers (poly lactic-co-glycolic acid and chitosan respectively); different forms of delivery systems including (but not limited to) liposomes, micelles, biodegradable nanoparticles, nondegradable nanoparticles, and solid porous scaffolds; applications of these material-based delivery systems from targeted chemotherapy to bone regeneration to vaccination applications.

Graduate

PHAR:8000 Introduction to Pharmaceutics Projects 3 s.h.
Introduction to pharmaceutics.

PHAR:3740 End-of-Life Care for Adults and Families 2-4 s.h.

PHAR:8100 Introduction to Pharmacy Practice 1 s.h.
Exposure to the pharmacy profession through varied shadowing experiences in practice settings. Requirements: P1 standing.

PHAR:8101 Pharmacy Practice Lab I 2 s.h.
Practical application of scientific and clinical knowledge used in the provision of pharmaceutical care; activities include communication with patient and members of the healthcare team, sterile product and prescription compounding, pharmacy calculations, and use of drug information resources. Requirements: P1 standing.

PHAR:8102 Pharmacy Practice Lab II 2 s.h.
Practical application of scientific and clinical knowledge used in the provision of pharmaceutical care; activities include prescription compounding, pharmacy calculations, communication skills, prescription counseling, and applications of drug information skills through secondary searching of the primary literature. Prerequisites: PHAR:8101. Requirements: P1 standing.

PHAR:8103 Fundamentals of Evaluating Clinical Research 1 s.h.
Basic concepts for evaluation of clinical trials published in primary biomedical and pharmacy literature; design, methods, outcomes, statistical analysis, and generalizability of results. Requirements: P1 standing.

**PHAR:8104 Pharmacy Law and Ethics** 2 s.h.
Legal and moral aspects involved in the practice of pharmacy. Requirements: P3 standing.

**PHAR:8105 Social Aspects of Pharmacy** 2 s.h.
Care
Conceptual issues related to social and behavioral components of pharmacy care; social construction of health and illness, medication use process, health communications, cultural competence, health disparities, public health. Requirements: P1 standing.

**PHAR:8106 Foundations of Pharmaceutical Sciences** 5 s.h.
Comprehension and application of molecular structures and functional groups to altering properties of molecules; solution and solid drug properties; drug instability; dosage forms and fundamental principles of toxicology. Requirements: P1 standing.

**PHAR:8110 Foundations of Pharmacy Practice** 4 s.h.
Introduction to contemporary pharmacy practice. Requirements: P1 standing.

**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 Professional Engagement** 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 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: P1 standing.

**PHAR:8133 Introductory Pharmacy Practice Experience Shadowing** 1 s.h.
Experience shadowing a pharmacist for six hours in four different pharmacy practice settings for a total of 24 hours; 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 I** 3 s.h.
Introduction and overview of foundations of pharmaceutical sciences. Requirements: P1 standing.

**PHAR:8137 Foundations of Pharmaceutical Sciences II** 2 s.h.

**PHAR:8200 Introduction to Community Pharmacy Practice** 3 s.h.
Exposure to community pharmacy through activities focusing on drug distribution, legal requirements, communication, patient interaction; during breaks in P2 year. Requirements: P2 standing.

**PHAR:8201 Clinical Practice Skills I: Theory and Application** 2 s.h.
Exploration and development of professional skills required for delivery of patient care; patient assessment, clinical decision making, communication (written and oral), teamwork. Corequisites: PHAR:8242.

**PHAR:8203 Pharmacy Practice Lab III** 2 s.h.
Practical application of scientific and clinical knowledge in the provision of patient-centered care; activities include prescription interpretation and counseling, compounding, applications of drug information, use of patient screening tools, physical assessment, and pharmacy law. Corequisites: PHAR:8240 and PHAR:8241, if not taken as prerequisites.

**PHAR:8204 Pharmacy Practice Lab IV** 2 s.h.
Practical application of scientific and clinical knowledge in the provision of patient-centered care; activities include providing medication therapy management for patients, prescription and self-care counseling, and application of drug information skills. Corequisites: PHAR:8242 and PHAR:8243, if not taken as prerequisites. Requirements: P2 standing.

**PHAR:8205 Student Pharmacist Professionalism** 1 s.h.
Participation in activities promoting leadership and professional learning, and service learning; required participation P1 through P3 years.

**PHAR:8206 Introduction to Hospital Pharmacy Practice** 2 s.h.
Exposure to hospital pharmacy through activities focusing on drug distribution, legal requirements, communication, patient interaction; during breaks in P2 year. Requirements: P2 standing.

**PHAR:8240 Introduction to Therapeutics/Special Populations**

Treatment modalities that promote health and treat common diseases; common laboratory and diagnostic procedures used to diagnose and monitor diseases; basic types of adverse drug reactions. Requirements: P2 standing.

**PHAR:8241 Endocrinology, Ophthalmology, Women's and Men's Health Therapeutics**

Pharmacotherapy for endocrine and ophthalmologic disorders; review of disorders, treatment goals, treatment plans, patient counseling, monitoring of patient outcomes. Requirements: P2 standing.

**PHAR:8242 Respiratory and Dermatologic Therapeutics**

Pharmacotherapy for respiratory and dermatology disorders; review of disorders, treatment goals, treatment plans, patient counseling, monitoring of patient outcomes. Requirements: P2 standing.

**PHAR:8243 Cardiovascular Therapeutics**


**PHAR:8300 Introduction to Clinical Pharmacy Practice**

Clinical practice experience observing and participating in clinical activities with P4 students, faculty, and other health care providers. Requirements: P3 standing.

**PHAR:8302 Clinical Practice Skills II: Critical Patient Analysis**

Continuation of PHAR:8201; development of professional skills required for delivery of patient care; patient assessment, clinical decision making, communication (written and oral) skills. Corequisites: PHAR:8340. Requirements: P3 standing.

**PHAR:8303 Clinical Practice Skills III: Applied Patient Management**

Continuation of PHAR:8302; development of professional skills required for delivery of patient care; patient assessment, clinical decision making, communication (written and oral), teamwork. Corequisites: PHAR:8342. Requirements: P3 standing.

**PHAR:8305 Pharmacy Practice Lab V**

Practical application of scientific and clinical knowledge in the provision of patient-centered care; activities include medication therapy management for patients, prescription and self-care counseling, and application of drug information skills. Corequisites: PHAR:8340 and PHAR:8341, if not taken as prerequisites.

**PHAR:8306 Pharmacy Practice Lab VI**

Practical application of scientific and clinical knowledge in the provision of patient-centered care; activities include medication therapy management for patients, prescription and self-care counseling, and application of drug information skills. Corequisites: PHAR:8342 and PHAR:8343, if not taken as prerequisites. Requirements: P3 standing.

**PHAR:8308 Pharmaceutical Economics and Insurance**

Financing of health care in the U.S.; insurance and reimbursement in pharmacy and pharmacoconomics. Requirements: P3 standing.

**PHAR:8309 Pharmacy Management and Marketing**

Application of management principles to pharmacy practice; marketing techniques for pharmacy practice; operations, human resources, finance, quality improvement and service marketing management.

**PHAR:8313 Drug Literature Evaluation**

Study design methods, drug information techniques and skills; skill development in critical analysis and evaluation of published reports of drug use and drug trials, assessment of validity of reports, trials and studies, assessment of generalizability of results to individual patients and patient groups; laboratory experience in biomedical literature analysis, evaluation.

**PHAR:8340 FEN, GI, and Renal Therapeutics**

Pharmacotherapy for fluid/electrolyte/nutrition disorders; gastrointestinal and renal diseases; review of disorders, treatment goals, treatment plans, patient counseling, monitoring of patient outcomes. Requirements: P3 standing.

**PHAR:8341 Rheumatology, Immunology, Hematology, Oncology, and Transplantation Therapeutics**

Pharmacotherapy for rheumatology, immunology, hematology, oncology, and transplantation; review of disorders, treatment goals, treatment plans, patient counseling, monitoring of patient outcomes. Requirements: P3 standing.

**PHAR:8342 Neurology/Psychiatry Therapeutics**

Pharmacotherapy for psychiatric and neurologic disorders; review of disorders, therapeutic goals, treatment plans, patient counseling, monitoring of patient outcomes. Requirements: P3 standing.

**PHAR:8343 Infectious Disease Therapeutics**

Pharmacotherapy for infectious diseases; review of disease, therapeutic goals, treatment plans, patient counseling, monitoring of patient outcomes. Requirements: P3 standing.

**PHAR:8702 Dean's Pharmacy Forum II**

Contemporary issues in pharmacy practice, pharmacy education, and health care.
PHAR:8703 Web 2.0 and Pharmacy Drug Information 2 s.h.
Introduction to challenges and opportunities of social Internet applications, electronic drug information sources, and mobile technologies available to healthcare providers and patients; creation, use, and critical evaluation of web-based products; lectures, class discussions, required readings, reflection blogs, and group projects. Requirements: P1, P2, or P3 standing.

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

PHAR:8708 Substance Abuse 2 s.h.
Themes and concepts in substance abuse and treatment; stimulants, depressants, alcohol, opiates, hallucinogenics, steroids; drug abuse prevention and treatment, including dual diagnosis, from cradle to the grave.

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

PHAR:8715 Health Disparities and Cultural Competence 2-4 s.h.
Characteristics, causes, and effects of health disparities in the U.S. health care system; foundation for development of knowledge, attitudes, and skills required of culturally competent health care providers; definitions and models of cultural competence, characteristics of culturally effective practitioners and workplaces; health disparities among specific populations, evidence for cultural competence as a remedy; taking a culturally appropriate history; working with interpreters; legal and professional imperatives for cultural competence. Same as NURS:3715.

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. Prerequisites: PHAR:8241 and PHAR:8243. Requirements: P3 standing.

PHAR:8718 Special Topics in Acute Care 2 s.h.
Pharmacology for common but varied acute care medicine topics; review of disorder, therapeutic goals, treatment plans, patient counseling, monitoring patient outcomes; lecture or case-based classes; acute and chronic renal failure; peritoneal and hemodialysis; diabetic ketoacidosis; rhabies; shock, vasoressors, fluids; ACLS; deep venous thrombosis, stress ulcer prophylaxis; burns; sedation, neuromuscular blockage; opioids; multiple sclerosis. Prerequisites: PHAR:8240 and PHAR:8241 and PHAR:8242 and PHAR:8243 and PHAR:8340 and PHAR:8341. Corequisites: PHAR:8342 and PHAR:8343. Requirements: B.L.S. certification.

PHAR:8719 Overview of Pediatric Pharmacotherapy 2 s.h.
Discussion of issues and problems in pediatric pharmacotherapy; clinical practicum. Prerequisites: PHAR:8230 and PHAR:8240. Requirements: P3 standing.

PHAR:8720 Health Coaching and Wellness 2 s.h.
Develop expertise in health coaching and wellness to care for patients with chronic diseases; in-depth look at lifestyle changes recommended for patients with chronic diseases; discuss and investigate nutrition and exercise guidelines for patients with chronic diseases; motivational interviewing technique and incorporation of chronic care model for patients. Requirements: P2 or P3 standing.

PHAR:8721 Leadership and Political Advocacy arr.
Contemporary issues in pharmacy; role of leadership and advocacy in shaping profession; becoming effective advocates within political and policy making process; development of advocacy and leadership skills essential to improve self, profession, and community. Requirements: P1, P2, or P3 standing. Recommendations: PHAR:8702 and PHAR:8722.

PHAR:8722 Current Topics in Health Policy 2 s.h.
Legislative process and broad range of current issues in health policy; general- and pharmacy-specific health policy topics at state and federal levels. Requirements: P1, P2, P3, or graduate standing.

PHAR:8723 Infectious Disease for Acute Care Practice 1 s.h.
Contemporary issues related to infectious diseases; unusual pathogens such as Ebola, tropical medicine, bioterrorism, resistance, travel medicine, epidemiology.

PHAR:8724 Hospital Pharmacy Practice Management Elective 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: P3 standing.

PHAR:8725 Career Pathways in Pharmacy 1 s.h.
Career preparation through writing, speaking, reading, and listening; writing résumés, curricula vitae, cover letters; interviewing techniques; electronic portfolios; web-based career information; guest speakers from pharmacy associations, major chains; workshop approach. Requirements: P3 standing.

PHAR:8788 International Perspectives: Xicotepec 2-3 s.h.
Introduction to providing service to a community in a less developed country; student projects intended to improve community life in Xicotepec. Requirements: P3 standing. Same as CEE:4788, GHS:4126.

PHAR:8790 Topics in Community Pharmacy Management 2 s.h.
Focus on building practical knowledge and understanding of business principles.

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

**PHAR:9402 Elective Ambulatory Care Rotation** 6 s.h.
Clinical experience providing pharmaceutical care in specialty outpatient settings. Requirements: P4 standing.

**PHAR:9403 Elective Nuclear Pharmacy Rotation** 6 s.h.
Practical experience in the handling and clinical use of radiopharmaceuticals. Requirements: P4 standing.

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

**PHAR:9405 Elective Hospice and Palliative Care Rotation** 6 s.h.
Clinical experience providing pharmacotherapy for end-of-life care. Requirements: P4 standing.

**PHAR:9406 Elective: Drug Information Rotation** 6 s.h.
Practice experience applying drug information knowledge to service and research projects. Requirements: P4 standing.

**PHAR:9407 Elective Family Medicine Rotation** 6 s.h.
Clinical practice experience applying primary care therapeutics in family medicine practice settings. Requirements: P4 standing.

**PHAR:9408 Elective Hematology/Oncology Rotation** 6 s.h.
Drug therapy management of oncology patients and patients with hematologic malignancies, aplastic anemia, sickle cell disease, hemophilia. Requirements: P4 standing.

**PHAR:9409 Elective Home Health Care Rotation** 6 s.h.
Clinical experience in the team approach to health care delivery, including total parenteral nutrition, chemotherapy, intravenous antibiotics, lab analysis, hospice care, and pain management. 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:9411 Elective Long Term Care Rotation** 6 s.h.
Practice in consulting and providing services to varied long-term patient care environments. Requirements: P4 standing.

**PHAR:9412 Elective Managed Care Rotation** 6 s.h.
Practice experience in providing pharmaceutical care or pharmacy-related services in a managed care organization. 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:9414 Elective Neurology Rotation** 6 s.h.
Clinical experience in the pharmacotherapeutic and pathophysiologic considerations of neurological disorders. Requirements: P4 standing.

**PHAR:9415 Elective: Pediatrics Rotation** 6 s.h.
Clinical experience in drug therapy management of general and specialty pediatric patients. Requirements: P4 standing.

**PHAR:9416 Elective: Pharmacy Rotation** 6 s.h.
Selected practice experiences in various pharmacy practice settings. Requirements: P4 standing.

**PHAR:9417 Elective Psychiatry Rotation** 6 s.h.
Clinical experience in the rational use of drugs in psychiatric disorders. Requirements: P4 standing.

**PHAR:9418 Elective Research Rotation** 6 s.h.
Practice experience in basic pharmaceutical or clinical research; proposal, study design, data collection and analysis, presentation of results. Requirements: P4 standing.

**PHAR:9419 Elective: Surgery Rotation** 6 s.h.
Clinical experience in drug therapy management on a surgery unit. Requirements: P4 standing.

**PHAR:9420 Elective Pharmacy Practice Underserved Population Rotation** 6 s.h.
Opportunity to learn the best practices for pharmaceutical management; approaches to enhance access to and appropriate use of medicines in underserved and resource-limited environments. Requirements: P4 standing.

**PHAR:9421 Elective Community Management Rotation** 6 s.h.
Practice exposure to community pharmacy operations and management at the store, district, or corporate level. Requirements: P4 standing.

**PHAR:9422 Elective: Compounding/Complimentary Alternative Medicine Rotation** 6 s.h.
Clinical work in a community setting with focus on team approach; experience developing extemporaneous compounds to optimize patient care and/or integrating traditional and nontraditional medicine. Requirements: P4 standing.
PHAR:9423 Elective: Critical Care Medicine Rotation
Practice experience providing pharmaceutical services to intensive care unit patients. Requirements: P4 standing.

PHAR:9424 Elective Emergency Medicine Rotation
Clinical experience providing pharmaceutical care for patients treated in the emergency department. Requirements: P4 standing.

PHAR:9425 Elective Hospital Management Rotation
Practice experience in hospital pharmacy operations and management. Requirements: P4 standing.

PHAR:9426 Elective Infectious Disease Rotation
Clinical experience providing pharmacotherapeutic management of patients receiving antimicrobial medications. Requirements: P4 standing.

PHAR:9427 Elective Medication Use Evaluation Rotation
Practical experience in drug use evaluation to improve patient outcomes. Requirements: P4 standing.

PHAR:9428 Elective Pharmacy Industry Rotation
Practice experience in an area of the pharmaceutical industry. Requirements: P4 standing.

PHAR:9429 Elective Pharmacy Regulatory Rotation
Practice experience with a pharmacy regulatory body. Requirements: P4 standing.

PHAR:9430 Elective: Professional Association Rotation
Practice experience in professional association management environment at the state or national level. Requirements: P4 standing.

PHAR:9431 Elective: Veterinary Pharmacy Rotation
Practice experience in managing drug therapy for animals. Requirements: P4 standing.

PHAR:9432 Elective: Advanced Community Pharmacy Rotation
Community pharmacy experience emphasizing patient-centered care. Requirements: P4 standing.

PHAR:9433 Elective Academic Rotation
Practice experience delivering pharmacy education with a College of Pharmacy faculty member. Requirements: P4 standing.

PHAR:9434 Elective International Pharmacy Rotation
Practice experience in pharmacy practice outside the United States. Requirements: P4 standing.

Pharmaceutical Sciences and Experimental Therapeutics for Pharm.D. Students

PHAR:8111 Pharmaceutics I: Solutions 4 s.h.
Application of physical and chemical principles to formulation, preparation of liquid dosage forms, including solution, colloids, ointments, emulsions. Requirements: P1 standing.

PHAR:8112 Pharmaceutics II: Solids and Semi-Solids 4 s.h.
Properties of solids; formulation, preparation, evaluation of solid dosage forms. Requirements: P1 standing.

PHAR:8121 Medicinal and Natural Products Chemistry I: Biotechnology and Chemotherapy 3 s.h.
Organic and inorganic medicinal and therapeutic agents of natural and synthetic origin; physical, chemical, biological, and biochemical properties as they relate to medicinal and therapeutic effects; comparative biological activity and toxicity; detoxication mechanisms; functional group chemistry; nomenclature; chemistry of radiodiagnostic and therapeutic agents; introduction to biopharmaceutical analysis. First in a three-course sequence. Prerequisites: CHEM:2220 and MICR:3112. Requirements: P1 standing.

PHAR:8122 Medicinal and Natural Products Chemistry II: Pharmacodynamic Agents 3 s.h.
Medicinal chemistry of pharmacodynamic agents; introduction to peptides and proteins, thyroid hormone, diabetes, vaccines, gene therapeutics, NSAIDs, cardiovascular drugs, antihistamines, anticancer drugs. Second in a three-course sequence. Prerequisites: PHAR:8121. Requirements: P2 standing.

PHAR:8123 Medicinal and Natural Products Chemistry III: Medicinal Neurochemistry 3 s.h.
Receptor site theory; steroids, lipids, and prostaglandins; sedatives and hypnotics; drugs of abuse; cholinergics; excitatory amino acids and anticonvulsants; major analgesics; adrenergics; psychotherapeutics. Third in a three-course sequence. Prerequisites: PHAR:8121 and PHAR:8122. Requirements: P2 standing.

PHAR:8213 Pharmacokinetics and Biopharmaceutics 3 s.h.
Qualitative and quantitative description of kinetics of drug absorption, distribution, and elimination, including physiological factors that influence each process; adjustment of dosing regimens for optimizing therapeutic drug levels in the body; dosing considerations in special populations. Prerequisites: PHAR:8111 and PHAR:8112.

PHAR:8230 Clinical Pharmacokinetics 3 s.h.
Application of pharmacokinetics to the clinical setting. Requirements: P2 standing.

PHAR:8710 Introduction to Pharmacogenomics 2 s.h.
Introduction to pharmacogenetics in pharmacy; laboratory techniques, application of pharmacogenetics to clinical pharmacy.
PHAR:8791 Survey of Basic Pharmaceutical Sciences 1 s.h.
Aspects of drug discovery and development; seminar with guest speakers from industry. Requirements: admission to Pharm.D. program.

**Pharmacy Practice and Science for Graduate Students**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHAR:5310</td>
<td>Pharmaceutical Socioeconomics Seminar</td>
<td>1-2 s.h.</td>
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<tr>
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<td>Recent research in pharmacy administration.</td>
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<tr>
<td>PHAR:5335</td>
<td>Social Aspects of Pharmacy Care</td>
<td>2 s.h.</td>
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<td>Conceptual issues related to social and behavioral components of pharmacy care; social construction of health and illness, medication use process, health communications, cultural competence, public health.</td>
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<td>PHAR:5350</td>
<td>Introduction to Research Methods</td>
<td>3 s.h.</td>
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<td>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.</td>
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<tr>
<td>PHAR:6305</td>
<td>Foundation Literature in Pharmaceutical Socioeconomics</td>
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<td>Issues related to pharmacy administration, social and behavioral pharmacy, pharmacy education.</td>
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<tr>
<td>PHAR:6320</td>
<td>Pharmaceutical Socioeconomics Research</td>
<td>arr.</td>
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<tr>
<td>PHAR:6330</td>
<td>Models of Patient Behavior and Choice</td>
<td>3 s.h.</td>
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<tr>
<td></td>
<td>Theoretical models used to describe behavior and choice in pharmaceutical socioeconomic research; models from economics, health services research, health behavior, clinical decision making.</td>
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<tr>
<td>PHAR:6331</td>
<td>Models of Provider Behavior and Choice</td>
<td>3 s.h.</td>
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<td>Theoretical background for study of provider decision making and behavior; models based on a classic economic approach, models used to study provider behavior.</td>
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<tr>
<td>PHAR:7330</td>
<td>Analytic Issues in Health Services Research I</td>
<td>3 s.h.</td>
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<td>Analytic tools used in health services research; focus on applications in nonexperimental research settings, such as analyses using administrative claims data or preexisting public use data sets. Prerequisites: BIOS:5120. Same as HMP:7960.</td>
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<tr>
<td>PHAR:7331</td>
<td>Analytic Issues in Health Services Research II</td>
<td>3 s.h.</td>
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<td>Continuation of HMP:7960; advanced applications, including panel data and qualitative response models. Prerequisites: HMP:7960. Same as HMP:7965.</td>
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**Pharmaceutical Sciences and Experimental Therapeutics for Graduate Students**

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<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>PHAR:3748</td>
<td>Quantitative Research Methods II: Materials Characterization</td>
<td>2 s.h.</td>
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<tr>
<td></td>
<td>Introduction to physical methods of pharmaceutical materials characterization; thermal, electrochemical, and spectrophotometric methods; lecture, discussion, and laboratory activities.</td>
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<tr>
<td>PHAR:5110</td>
<td>Clinical Pharmaceutical Sciences Seminar</td>
<td>1-2 s.h.</td>
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<tr>
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<td>Research by faculty, graduate students.</td>
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<tr>
<td>PHAR:5135</td>
<td>Introduction to Clinical Pharmacogenomics</td>
<td>3 s.h.</td>
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<td>Basic pharmacogenetic techniques; use of pharmacogenomics in clinical pharmacy. Prerequisites: BIOL:2512.</td>
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<tr>
<td>PHAR:5510</td>
<td>Medicinal and Natural Products Chemistry Seminar</td>
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<td>Contemporary research in medicinal chemistry and natural products.</td>
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<td>PHAR:5512</td>
<td>Drug Discovery and Mechanisms</td>
<td>3 s.h.</td>
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<td>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.</td>
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<tr>
<td>PHAR:5515</td>
<td>Perspectives in MNPC Research</td>
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<td></td>
<td>Contemporary research in medicinal chemistry and natural products.</td>
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<tr>
<td>PHAR:5520</td>
<td>Medicinal and Natural Products Chemistry Research</td>
<td>arr.</td>
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<tr>
<td>PHAR:5521</td>
<td>High Throughput Screening for Pharmaceutical and Biomedical Sciences</td>
<td>1 s.h.</td>
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<td>Broad introduction to high throughput screening (HTS) and its application in pharmaceutical and biomedical sciences; HTS as a modern technology platform integrated with robust detection systems and robotic liquid handling instruments; use of HTS platforms to identify biologically active small organic molecules to validate drug targets, screen compound libraries; identification of biologically active small molecules for use as probes, tool compounds, drug leads; systematic, unbiased, and/or focused hypothesis-based approaches for mechanistic studies in biological and medical sciences. Recommendations: bachelor degree in biochemistry, chemistry, molecular biology, pharmacology, or equivalent.</td>
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<tr>
<td>PHAR:5537</td>
<td>Enzymatic Basis of Drug Metabolism</td>
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<td>Current literature on catalytic and physical properties, distribution, and substrate specificity of enzymes involved in mammalian drug metabolism. Prerequisites: CHEM:2220.</td>
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<tr>
<td>PHAR:5541</td>
<td>Total Synthesis of Natural Products</td>
<td>3 s.h.</td>
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</table>
Total synthesis of natural products; use of strategies, tactics, efficiency, selectivity, synthetic maneuvering.

**PHAR:5542 Enzyme Mechanisms and Ligand Interactions** 1 s.h.
Enzymes as unparalleled catalysts that represent a unique class of drug targets; focus on organic chemistry of enzyme catalyzed reactions and enzyme inhibition by small molecules from a medicinal chemistry perspective; chemical and enzyme kinetics, sources of catalytic power, chemical mechanisms used in enzyme catalysis, role of coenzymes; strategies in enzyme inhibition, drug resistance, drug synergism, reversible enzyme inhibitors, transition state analogs, slow tight binding inhibitors, irreversible inhibition; taken alone or with BIOC:5242. Requirements: introductory course in biochemistry. Same as BIOC:5244.

**PHAR:5544 Pharmaceutical and Chemical Toxicology** 3 s.h.
Principles and mechanisms of chemical toxicology related to drugs and environmental agents; modern toxicological research methods.

**PHAR:5545 Current Medicinal Chemistry** 3 s.h.
Modern techniques used in drug discovery; important drug classes, their chemical mechanism of action.

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

**PHAR:5550 Synthetic Strategies in Medicinal Chemistry** 3 s.h.
Modern chemical methods for construction of carbon-carbon bonds commonly used in synthesis of natural products; strategic disconnections for the syntheses of these molecules.

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

**PHAR:5745 Drug Delivery: Principles and Applications I** 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.


**PHAR:5875 Perspectives in Biocatalysis** 1-3 s.h.
Applied enzymology, protein design, structure-activity relationships, biosensor technology, microbial transformations, biodegradation of environmental pollutants. Requirements: graduate standing in a participating department supported by the Predoctoral Training Program in Biotechnology. Same as CHEM:5875, CBE:5875, CEE:5875, MICR:5875, BIOC:5875.

**PHAR:5930 Introduction to Pharmaceutical Sciences Research** 2 s.h.
Key principles and methods in pharmaceutical sciences research.

**PHAR:6120 Clinical Pharmaceutical Sciences Research** arr.

**PHAR:6130 Analytical Techniques in Therapeutics** 2 s.h.
Basic concepts of cell culture, animal models, and biochemical techniques for mechanistic evaluation of drug actions.

**PHAR:6501 Principles and Mechanisms of Chemical Toxicology** 1 s.h.
General principles and basic mechanisms of chemical and pharmaceutical toxicology; drug/toxicant disposition, including biotransformation and bioactivation to electrophiles.

**PHAR:6502 Toxic Agents and Concepts in Toxicology** 1 s.h.
Specific classes of toxicants and non-organ directed toxicity, including chemical carcinogenesis, oxidative stress, teratogenesis; clinical toxicology, antidotes, methods and models in toxicology.

**PHAR:6503 Target-Organ Toxicity** 1 s.h.
Role of drugs/toxicants in systems toxicity (target organ); hepatotoxicity, neurotoxicity, cardiotoxicity, and toxic responses of immune system.

**PHAR:6700 Pharmacokinetics and Pharmacodynamics** 3 s.h.
Kinetics of drug absorption, distribution, and elimination, including development of mathematical models. Requirements: two semesters of calculus and one semester of statistics.

**PHAR:6701 Stability of Pharmaceuticals** 3 s.h.
Mechanisms of degradation of pharmaceuticals; prediction of shelf life of pharmaceuticals, stabilization. Prerequisites: CHEM:4432.

**PHAR:6703 Product Development** 3 s.h.
Application of physico-chemical principles to formulation and design of pharmaceutical dosage forms.

**PHAR:6705 Selected Topics in Pharmaceutical Sciences** 1-4 s.h.
Recent advances and contemporary research in pharmaceutics.

**PHAR:6706 Equilibria Processes** 3 s.h.
Equilibria pertaining to ionic systems, complexation, partitioning, solubility. Prerequisites: CHEM:4431.

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

**PHAR:6720 Pharmaceutics Research** arr.

**PHAR:7100 Translational Research and Clinical Drug Development** 3 s.h.
Clinical drug development; preclinical studies and clinical trials; phase I, II, and III clinical trials, including regulatory considerations.
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:7700 Advanced Pharmacokinetics and Pharmacodynamics
3 s.h.
Selected topics, including nonlinear curve fittings. Prerequisites: PHAR:6700.

PHAR:7701 Surface Phenomena
arr.
Behavior of matter in phase boundaries, especially adsorptive processes at liquid-solid and vapor-solid interfaces. Prerequisites: CHEM:4431.

PHAR:7702 Transport Phenomena
3 s.h.
Diffusion and mass transport phenomena related to pharmaceutical systems. Prerequisites: CHEM:4431.