Pharmaceutical and Pharmacological Sciences

Introduction
The WVU School of Pharmacy offers graduate programs in the pharmaceutical and pharmacological sciences for the Ph.D. degree. The school is advantageously located in the Health Sciences Center complex which also houses all departments of the Schools of Medicine, Nursing, and Dentistry, as well as a comprehensive medical library, audio-visual and computer-based learning center, research core facilities, and laboratory animal quarters. State-of-the-art research laboratories are located throughout the Health Sciences Center complex to facilitate interactions with the Mary Babb Randolph Cancer Center, Center for Neuroscience, and Center for Cardiovascular and Respiratory Sciences. In addition, the Health Sciences Center has easy access to the Evansdale and Downtown campuses of WVU through a personal rapid transit (PRT) system. The scientific community, which is especially well-developed, draws on area scientists throughout WVU, the Centers of Disease Control/National Institute on Occupational Safety and Health (CDC/NIOSH), Federal Bureau of Investigation (FBI), and a variety of research centers supported by the National Institutes of Health (NIH), National Science Foundation (NSF), and the Department of Energy (DOE). A CDC/NIOSH research facility is two blocks away, and Mylan Pharmaceuticals, a leading generic drug producer in the world, is located across the street from the Health Sciences Center. In addition, the school has long-standing collaborations with several state agencies and multinational pharmaceutical companies.

Degrees Offered

- Doctor of Philosophy (Ph.D. in Pharmaceutical and Pharmacological Sciences)

Research interests are complementary to the focus of each of the two pathways in the program: pharmaceutical and pharmacological sciences, and health outcomes. Key areas of research interest and expertise in the pharmaceutical and pharmacological sciences pathway include: pharmaceutical sciences, pharmacology, cancer, neuroscience, nanoscience, and toxicology. Key areas of research interest and expertise in the health outcomes pathway include: health outcomes, health disparities, health services, health quality, pharmacoconomics, pharmacoepidemiology, patient reported outcomes, and health behavior.

Graduate Program Pharmaceutical and Pharmacological Science

The School of Pharmacy offers a doctor of philosophy (Ph.D.) degree in pharmaceutical and pharmacological sciences with two pathways aimed at training competent researchers and educators: health outcomes research, and pharmaceutical and pharmacological sciences. Both pathways in the graduate program provide interdisciplinary, research-oriented curricula designed to develop the interests, capabilities, and potential of the individual student.

Academic Standards

No credits are acceptable toward a graduate degree with a grade lower than a C. A graduate student is expected to have a cumulative grade point average of at least 3.0 in all graduate courses to continue in the program and to qualify for a Ph.D. degree.

Admission Requirements

Applicants for admission into the graduate program must satisfy the WVU and Health Sciences Center general requirements for admission as a graduate student. The applicant must possess a baccalaureate degree, background in a suitable area of study, an overall grade point average of at least 3.0, and the aptitude and interest for graduate work in pharmaceutical and pharmacological sciences or health outcomes research to be admitted. Graduate Record Examination (GRE) scores in the verbal, quantitative, and analytic essay portions are required from all students planning on entering the graduate program. TOEFL scores are required of international students from countries where English is not the primary language.

To obtain specific information related to the school’s graduate programs, graduate faculty research interests, and availability of graduate assistantships or fellowships, applicants may contact:

Office of Research and Graduate Programs
WVU School of Pharmacy
2036 Health Sciences Center North
P.O. Box 9500 Morgantown, WV 26506
Telephone: (304) 293-1480
e-mail: pgannett@hsc.wvu.edu

Doctor of Philosophy (Ph.D.)

The School of Pharmacy offers programs of study leading to the doctor of philosophy (Ph.D.) degree in the pharmaceutical and pharmacological sciences via two pathways: health outcomes research, and pharmaceutical and pharmacological sciences. Specialty areas of study include: pharmacology, drug metabolism, cancer cell biology, nanotechnology, health outcomes, epidemiology, and policy research.
Coursework and the suggested plan of study specific to each pathway are listed below.

For each pathway in the graduate program, upon completion of the second year of study, students must submit a formal plan of study and a research plan that is approved by their Ph.D. committee. Progress is expected to continue with guidance from the student’s research committee. Final admission to candidacy requires satisfactory performance on written and oral qualifying examinations as well as a dissertation proposal defense. Subsequent to admission to candidacy, a substantial part of the program is devoted to an original research project which culminates in a first-authored publication and dissertation. To be recommended for a Ph.D., the dissertation must be satisfactorily completed and defended at an oral examination.

For more specific information, please contact the associate dean for research and graduate programs:

Dr. Peter Gannett
Associate Dean for Research and Graduate Programs (Interim)
WVU School of Pharmacy
2036 Health Sciences Center North
P.O. Box 9500
Morgantown, WV 26506-9500
Telephone: (304) 293-1480
email: pgannett@hsc.wvu.edu

Requirements for Ph.D. Degree

PHARMACEUTICAL AND PHARMACOLOGICAL SCIENCES PATHWAY

Students planning on enrolling in the pharmaceutical and pharmacological sciences pathway are admitted through the health sciences center interdisciplinary graduate program in biomedical science, through which they complete the first year of study. During the first year, students take a required set of courses and rotate through the laboratories of potential research mentors. At the end of the first year, students may formally enroll in the pharmaceutical and pharmacological sciences graduate program and select a research advisor.

Curriculum Requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMS 700</td>
<td>Scientific Integrity</td>
<td>1</td>
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<tr>
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<td>Cellular Methods</td>
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<td>BMS 715</td>
<td>Molecular Genetics</td>
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<td>BMS 720</td>
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<tr>
<td>BMS 797</td>
<td>Research</td>
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<td>BMS Course</td>
<td>- Fundamentals of Contemporary Biomedical Research</td>
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<td>PHAR 796</td>
<td>Graduate Seminar</td>
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<tr>
<td>PHAR 797</td>
<td>Research</td>
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<td>PHAR 784</td>
<td>Pharmacology Journal Club</td>
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<tr>
<td>PHAR 787</td>
<td>Drug Discovery &amp; Development</td>
<td></td>
</tr>
<tr>
<td>Laboratory Rotations 1</td>
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Total Hours 84-120

Advanced courses/Electives Modules

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<td>Mass Spec Principles &amp; Practic</td>
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<td>CHEM 531</td>
<td>Advanced Organic Chemistry 1</td>
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<td>Biopharm &amp; Pharmacokinetics</td>
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<td>Drug Metabolism</td>
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**Suggested Plan of Study**

**First Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer</th>
<th>Hours</th>
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<tr>
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<td>BMS 715</td>
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*Students must sign up for a minimum of 9 hours*

**Second Year**

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<th>Hours</th>
<th>Summer</th>
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<td>4-7</td>
<td>Take Qualifying Exams</td>
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**Third Year**

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<td>PHAR 798</td>
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<tr>
<td>PHAR 797</td>
<td>3-4</td>
<td>PHAR 797</td>
<td>3</td>
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</table>
**Pharmaceutical and Pharmacological Sciences**

Proposal Defense

*Students must sign up for a minimum of 9 hours*

*Students must sign up for a minimum of 9 hours*

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<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer</th>
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<td>2-4 PHAR 798</td>
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| Journal Club (Select from the following) | 1 Journal Club (Select from the following) | 6  | PHAR 783 | 6 | PHAR 784 | 6 | PHAR 787 | 6

**Fourth Year**

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<td>PHAR 797</td>
<td>8-9</td>
<td>PHAR 797</td>
<td>7-9</td>
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<td>7-9</td>
<td>PHAR 796</td>
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**HEALTH OUTCOMES RESEARCH PATHWAY**

Students enrolling in the health outcomes pathway are admitted directly into the School of Pharmacy. To obtain specific application and admission information about the Ph.D. program pathway in health outcomes research, please visit: http://pharmacy.hsc.wvu.edu/orgp/Pathways/Health-Outcomes-Pathway.

**Curriculum Requirements**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>BIOS 601</td>
<td>Applied Biostatistics 1</td>
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<td>BIOS 602</td>
<td>Applied Biostatistics Lab</td>
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<tr>
<td>BIOS 603</td>
<td>Applied Biostatistics 2</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 604</td>
<td>Applied Biostatistics 3</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 612</td>
<td>Multivariate Analysis</td>
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</tr>
<tr>
<td>BMS 700</td>
<td>Scientific Integrity</td>
<td>3</td>
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<tr>
<td>PHAR 758</td>
<td>Ethcl/Rgltry Aspcts-Clin Rsrch</td>
<td>3</td>
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<tr>
<td>BMS 720</td>
<td>Scientific Writing</td>
<td>3</td>
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<tr>
<td>ECON 301</td>
<td>Intermed Micro-Economic Theory</td>
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<tr>
<td>PHAR 753</td>
<td>Soc/Bhvr l Thry/Hlth Otcm Rsrch</td>
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<tr>
<td>PHAR 756</td>
<td>Health Survey Research Methods</td>
<td>3</td>
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<tr>
<td>PHAR 754</td>
<td>Decision Analysis-Healthcare</td>
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<td>PHAR 786</td>
<td>Health Svcs Res/Sec Databases</td>
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<td>PHAR 755</td>
<td>Pharmacoeconomics</td>
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<td>PUBA 670</td>
<td>Health Systems</td>
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### PHAR 769
Adv Hlth Service Rsrch Methods 3

### PHAR course "Intro-OR/PR Outcome"
3

### PHAR 797
Research 1-15

### PHAR 798
Dissertation 1-6

### SBHS 701
Public Health Grant Writing 3

### PHAR 788 Graduate Seminar
4

### Electives
3-26

Total Hours 56-98

## Suggested Plan of Study

### First Year

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<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer</th>
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<tr>
<td>PHAR 788</td>
<td>1 Electives</td>
<td>2-6</td>
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Select one of the following:
- PHAR 753
- PHAR 756

Select one of the following:
- BMS 700
- PHAR 786
- PHAR 758
- PHAR 788

Select one of the following:
- PHAR 753
- PHAR 756

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<tr>
<th>Fall</th>
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<th>Spring</th>
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Select one of the following:
- PHAR 754
- PUBA 670
- PHAR 758
- PHAR 756

Select one of the following:
- Electives

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<tbody>
<tr>
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Total credit hours: 57-99
COURSES

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

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

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

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

PHAR 697. Research. 1-15 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U).

PHAR 700. Pharmacy as a Profession. 1 Hour.
PR: First professional year standing or consent. Introduces students to the concept of professionalism, the scope of pharmacy practice opportunities, the health care system as it relates to pharmacy, and other contemporary issues in pharmacy practice. (Grading will be S/U).

PHAR 701. Pharmaceutical Care Lab 1. 2 Hours.
PR: First professional year standing or consent. Students will develop skills in medical terminology, communications, information retrieval, dispensing, compounding, calculations, pharmaceutical care, and problem-solving skills.

PHAR 702. Pharmaceutics 1. 3 Hours.
PR: First professional year standing or consent. Introduces drug physical-chemical characteristics relevant to the design and performance of delivery systems. Pharmaceutical dosage forms taught include disperse and polydisperse systems (suspensions, emulsions, creams, ointments, aerosols and transdermals).

PHAR 703. Pharmacy Practice Experience 1. 1 Hour.
PR: First professional year standing or consent. Provides an overview of the roles and responsibilities of community pharmacists and provides experiential learning in a community pharmacy setting. First course in a six-semester sequence that introduces students to various pharmacy practice settings.

PHAR 704. Introduction to Research. 1 Hour.
Provides pharmacy students with a forum for the discussion of a wide variety of research activities and careers. Also provides an appreciation for the science on which the pharmacy profession is based and continually evolves.

PHAR 708. Pharmaceutics 2. 3 Hours.
PR: PHAR 702. Continuation of PHAR 702. Solids dosage forms (tablets, capsules, sustained-release), regulatory pathways for marketing drugs, and biopharmaceutical principles (dosage form behavior in body).

PHAR 709. Immunology/Biotechnology. 2 Hours.
PR: First year professional standing or consent. Students will learn basic functions of the immune system, elements of the pharmaceutical applications of biotechnology, and be introduced to the chemotherapy of infections.

PHAR 710. Pharmacy Practice Experience 2. 1 Hour.
PR: PHAR 703 or consent. Provides an overview of the roles and responsibilities of community pharmacists and provides experiential learning in a community pharmacy setting. Second course in a six-semester sequence that introduces students to various pharmacy practice settings.

PHAR 711. Chemical Properties of Drugs. 2 Hours.
PR: First year professional standing or consent. Principles of chemical stability and chemical properties as they relate to drug molecules. Topics to be covered include functional group analysis, solubility, oil/water partitioning, organic acids and bases, and drug decomposition and metabolism.

PHAR 712. Pharmaceutical Care Lab 2. 2 Hours.
PR: First professional year standing or consent. Continuation of PHAR 701.

PHAR 714. Intro Community Rotation. 4 Hours.
PR or CONC: PHAR 710. Students will gain experience preparing prescriptions, providing basic drug information to patients, and participating in disease prevention activities in a community pharmacy setting.

PHAR 715. Pharmacotherapeutics 1. 4 Hours.
PR: Second professional year standing or consent. Principles and concepts of pathophysiology and pharmacotherapeutics. An organ system approach to disease states and their therapeutic management is followed.

PHAR 716. Chemistry of Drug Action 1. 3 Hours.
PR: PHAR 711 or consent. Provides a basic understanding of relationships between the chemical structure of a drug and its biological effect. Physiochemical properties, enzymatic transformations and structure-activity relationships (SAR) of important pharmaceutical agents are discussed.
PHAR 717. Pharmacy Practice Experience 3. 1 Hour.
PR: Second professional year standing or consent. Introduces students to the principles of service learning through development of an on-site healthcare-related service project. Third course of a six-semester sequence that introduces students to various pharmacy practice settings.

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

PHAR 719. Pharmacy Practice Experience 4. 1 Hour.
PR: PHAR 717 or consent. Introduces students to the principles of service learning through implementation of an on-site healthcare related service project. Fourth course of a six-semester sequence that introduces students to various pharmacy practice settings.

PHAR 720. Patient Health Education. 2 Hours.
PR: Second professional year standing or consent. Interpersonal communication skills will be enhanced in the areas of patient-centered and colleague-centered communications. Students will learn processes for providing pharmaceutical care (e.g., interviewing and counseling patients; formulating a plan; monitoring; and documenting information).

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

PHAR 722. WMD and Disaster Planning. 1 Hour.
Through didactic, hands on instruction, and participation in real world disaster planning sessions and/or drills, students learn about weapons of mass destruct (WMD) surveillance and mitigation in addition to disaster planning principles.

PHAR 723. Pharmaceutical Care Lab 3. 1 Hour.
PR: Second professional year standing or consent. Continuation of PHAR 712.

PHAR 724. Pharmaceutical Care Lab 4. 2 Hours.
PR: Second professional year standing or consent. Continuation of PHAR 723.

PHAR 725. Pharmacotherapeutics 2. 4 Hours.
PR: PHAR 715 or consent. A continuation of PHAR 715.

PHAR 726. Chemistry of Drug Action 2. 2 Hours.
PR: PHAR 716 or consent. A continuation of PHAR 716.

PHAR 727. Medical Literature Evaluation. 2 Hours.
PR: Second professional year standing or consent. Emphasis is placed on the critical analysis and evaluation of the primary literature. Secondary and computerized information resources are also discussed, including other selected aspects of drug information.

PHAR 728. Pharmacy Management. 2 Hours.
PR: Second professional year standing or consent. This course provides an introductory survey of the basic principles of personnel and fiscal management as they apply to organizational planning and decision-making, organizational design and structure, leadership and control in organizations, and the issues facing pharmacy managers.

PHAR 729. Intro Institutional Rotation. 2 Hours.
PR or Conc: (PHAR 719 and PHAR 724) or consent. Gain experience in an institutional pharmacy setting.

PHAR 730. Pharmacotherapeutics 3. 4 Hours.
PR: PHAR 725 or consent. A continuation of PHAR 725.

PHAR 731. Biopharm & Pharmacokinetics. 3 Hours.
PR: Third year professional standing or consent. Fundamental principles of biopharmaceutics (physicochemical and biological processes affecting drug transit into the systemic circulation) and pharmacokinetics (kinetic and biological processes a drug undergoes upon entering the body).

PHAR 732. Non-Prescription Drugs. 3 Hours.
PR: Third year professional standing or consent. An advanced level course on the appropriate selection, and use of non-prescription drug products in the contemporary practice setting, the basis for self-medication, assessment of patient condition, and approach to patient counseling.

PHAR 733. Pharmacy Systems. 2 Hours.
PR: Third year professional standing or consent. Basic principles of financial management as they apply to the day-to-day operations in pharmacy systems present in institutional, community, long-term care facilities and other pharmacy venues.

PHAR 734. Pharmacy Law and Ethics. 3 Hours.
PR: First professional year standing or consent. The legal and ethical basis of pharmacy practice. Students learn about federal and state statutes, rules, and regulations that affect pharmacy practice. Ethics related situations that can arise during pharmacy practice will also be discussed.

PHAR 735. Pharmaceutical Care Lab 5. 1 Hour.
PR: PHAR 724. Continuation of PHAR 724.
PHAR 736. Pharmaceutical Care Lab 6. 1 Hour.
PR: Third Year Professional standing or consent. Experience in pharmaceutical compounding, patient assessment and monitoring, professional/ethical decision making, pharmacokinetic dosing of medications, and prevention of adverse drug-related events and medication errors.

PHAR 737. Disease Prevent Health Promo. 2 Hours.
PR: Third year professional standing or consent. This course exposes pharmacy students to pharmacoepidemiology and public health. Instruction focuses on pharmacists as integral to preventing and detecting disease and promoting community health. Emphasis is given to rural health care and Appalachian culture.

PHAR 738. Outcomes Assessment/Quality Improvement. 2 Hours.
PR: Third professional year standing or consent. Outcomes assessment and quality improvement will expose students to the development and implementation of formularies, drug use evaluations, outcomes assessment, and quality improvement. Emphasis will be placed on how these issues relate to pharmaceutical services.

PHAR 739. Therapeutic Patient Monitoring. 3 Hours.
PR: Third professional year standing or consent. Employs both didactic and experiential instruction to provide students with the knowledge and skills required to assess the health status of medicated patients with special emphasis on monitoring therapeutic endpoints.

PHAR 740. Pharmacotherapeutics 4. 4 Hours.
PR: PHAR 730 or consent. A continuation of PHAR 730.

PHAR 741. Clinical Pharmacokinetics. 3 Hours.
PR: PHAR 731 or consent. This course will review advanced concepts in pharmacokinetics and cover the basic pharmacokinetic properties of commonly used drugs and apply these principles to drug dosing, patient management, and rational therapeutic drug monitoring.

PHAR 742. Pharmacy Practice Experience 5. 1 Hour.
PR: Third professional year standing or consent. Provides experiential learning in an acute or ambulatory care pharmacy practice setting. Fifth course in a six-semester sequence that introduces students to various pharmacy practice settings.

PHAR 743. Teach to Learn: Learn to Teach. 3 Hours.
Provides pharmacy students the opportunity to learn how to teach in higher education/pharmacy and develop their teaching skills by participating in select teaching and learning activities.

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

PHAR 746. Pharmacy Practice Experience 6. 1 Hour.
PR: PHAR 742 or consent. Provides experiential learning in an acute or ambulatory care pharmacy practice setting. Sixth course in a six-semester sequence that introduces students to various pharmacy practice settings.

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

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

PHAR 749. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy. (Grading may be P/F.)

PHAR 749A. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy. (Grading may be P/F.)

PHAR 749B. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy or clinical pharmacy. (Grading may be P/F.)

PHAR 749C. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy or clinical pharmacy. (Grading may be P/F.)

PHAR 749D. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy or clinical pharmacy. (Grading may be P/F.)

PHAR 749E. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems, and policy, or clinical pharmacy. (Grading may be S/U.)
PHAR 749F. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749G. Pharmaceutical Investigation. 2-3 Hours.
PR 749G. Pharmaceutical Investigation. 2-3 Hr, PR: Consent. Original Investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy. (Grading may be P/F.).

PHAR 749H. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749I. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749J. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749K. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749L. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749M. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749N. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749O. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749P. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749Q. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749R. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749S. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749T. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749U. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749V. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).

PHAR 749W. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy.
(Grading may be P/F.).
PHAR 749X. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy. (Grading may be P/F.).

PHAR 749Y. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy. (Grading may be P/F.).

PHAR 749Z. Pharmaceutical Investigation. 2-3 Hours.
PR: Consent. Original investigation in pharmaceutics, medicinal chemistry, pharmacology, pharmaceutical systems and policy, or clinical pharmacy. (Grading may be P/F.).

PHAR 750. Automation and Technology. 2 Hours.
PR: Second year professional standing or consent. Provides an understanding of the newest technology that is available to a pharmacist in a retail or institutional setting. Students will learn to use PowerPoint, and gain experience making presentations and public speaking.

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

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

PHAR 753. Soc/Bhvrl Thry/Hlth Otcm Rsrch. 3 Hours.
Basic social and behavioral theories related to the health behavior change and health outcomes. Open to graduate students in pharmacy, public health, or other health care fields.

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

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

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

PHAR 758. Ethcl/Rgltry Aspects-Clin Rsrch. 1 Hour.
Provides overview of ethical and regulatory aspects of clinical research. Grading will be Pass/Fail.

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

PHAR 760. Acute Care Rotation 1. 5 Hours.
PR: Fourth year professional standing or consent. Five-week experience in the delivery of pharmaceutical care in an acute care setting.

PHAR 761. Acute Care Rotation 2. 5 Hours.
PR: Fourth year professional standing or consent. Experience in the delivery of pharmaceutical care in an acute care setting.

PHAR 762. Ambulatory Care Rotation 1. 5 Hours.
PR: Fourth year professional standing or consent. Experience in the delivery of pharmaceutical care in an ambulatory care setting.

PHAR 763. Ambulatory Care Rotation 2. 5 Hours.
PR: Fourth year professional standing or consent. Five-week experience in the delivery of pharmaceutical care in an ambulatory care setting.

PHAR 764. Elective Rotation 1. 5 Hours.
PR: Fourth year professional standing or consent. Five-week experience in a pharmacy practice setting, such as acute care, ambulatory, community, hospital, poison center, drug information, home health, long-term care, or research.

PHAR 765. Elective Rotation 2. 5 Hours.
PR: Fourth year professional standing or consent. Five-week experience in a pharmacy practice setting, such as acute care, ambulatory, community, hospital, poison center, drug information, home health, long-term care, or research.

PHAR 766. Elective Rotation 3. 5 Hours.
PR: Fourth year professional standing or consent. Five-week experience in a pharmacy practice setting, such as acute care, ambulatory, community, hospital, poison center, drug information, home health, long-term care, and research.
PHAR 769. Adv Hlth Service Rsrch Methods. 3 Hours.
Provides a working knowledge of health services research methods and how to apply these methods to answer typical research questions in health services research. The course will examine concepts but will have an applied focus with hands-on research using publicly available data sets or those that the students have access for their dissertations/ manuscripts.

PHAR 770. Community Rotation. 5 Hours.
PR: Fourth year professional standing or consent. Five-week experience in the delivery of pharmaceutical care in a community pharmacy setting.

PHAR 772. Institutional Rotation. 5 Hours.
PR: Fourth year professional standing or consent. Five-week experience in the delivery of pharmaceutical care in a health system setting.

PHAR 775. Advanced Biopharmaceutcs. 3 Hours.
Concepts of biopharmaceutics and pharmacokinetics in relation to the design and evaluation of dosage forms and determination of rational dosage regimens in health and disease.

PHAR 779. Drugs: Bench to Market. 3 Hours.
PR: Graduate standing or permission of instructor. This is an introductory course that describes the process of drug discovery to the development of new forms for therapeutic use. Topics covered include drug design/discovery, pharmacokinetics and dynamics, pharmaceutics and industry pharmacy.

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

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

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

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

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

PHAR 786. Health Svcs Res/Sec Databases. 3 Hours.
PR: PHAR 785. This course presents various topics related to large databases including common study designs, advantages and limitations, and basic steps to extracting and analyzing large databases.

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

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

PHAR 789. Seminar in Nanoscience. 2 Hours.
Facilitates interdisciplinary research at the nanoscale by providing a forum for discussion and exploration of nanoscale science an engineering from a variety of perspectives including research and development of nanoscale devices and systems. Grading will be Pass/Fail.

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

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

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

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

PHAR 794A-Z. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.
PHAR 795. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

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

PHAR 797. Research. 1-15 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U).

PHAR 798. Dissertation. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798). Grading is normal.

PHAR 799. Graduate Colloquium. 1-6 Hours.
PR: Consent. For graduate students not seeking coursework credit but who wish to meet residency requirements, use the University’s facilities, and participate in its academic and cultural programs. Note: Graduate students who are not actively involved in coursework or research are entitled, through enrollment in their department’s 699/799 Graduate Colloquium to consult with graduate faculty, participate in both formal and informal academic activities sponsored by their program, and retain all of the rights and privileges of duly enrolled students. Grading is P/F; colloquium credit may not be counted against credit requirements for masters programs. Registration for one credit of 699/799 graduate colloquium satisfies the University requirement of registration in the semester in which graduation occurs.