

PHARMACOLOGY (PHR)

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GRADUATE STUDY IN PHARMACOLOGY

Master of Science (M.S.) Degree Program in Pharmaceutical Sciences

This program is a joint effort on the part of the Department of Pharmacology in the School of Medicine and the Department of Pharmacy Sciences in the School of Pharmacy and Health Professions. This program provides instruction in one of five disciplines: Pharmacology, Toxicology, Pharmaceutics, Pharmacokinetics and Medicinal Chemistry. Two tracks are offered: (1) a dual track culminating in the simultaneous granting of the Pharm.D. and M.S. degrees and (2) a single track for students with a B.S. in a biological or physical science, culminating in the awarding of the M.S. degree.

Doctor of Philosophy (Ph.D.) Program

The objectives of this program are to prepare highly qualified students for careers in research and teaching in the field of pharmacology. Ph.D. candidates will be required to demonstrate a broad knowledge of the field of pharmacology and detailed expertise in their research area. Graduate studies in pharmacology will provide graduate students with a comprehensive educational program in pharmacology. During the program of studies, the pharmacology graduate student will work closely with his or her mentor and department faculty to master the program goals. These goals include student demonstration of an advanced mastery of pharmacology as evidenced by the ability to critically judge research in the field of pharmacology, initiate scholarly activity based on current literature, and maintain the highest ethical and professional standards.

Program Goals

The student will carry out the following objectives for completion of the graduate program in pharmacology:

1. Demonstrate an advanced knowledge of pharmacology and a detailed comprehension of the student's specialized field of pharmacology.
2. Illustrate critical and analytical thinking in studying literature, developing hypotheses, executing research, solving scientific problems, and interpreting results.
3. Effectively communicate research results and scientific information in an oral as well as verbal format to both scientific and lay audiences.
4. Demonstrate the ability to independently propose, defend and conduct research in pharmacology for the benefit of science and in the service to others.
5. Display ethical behavior with regard to professional conduct.
6. Exhibit skills that will educate and train others in the field of pharmacology.

The student may choose to concentrate his or her studies in numerous specialized areas of pharmacology. These areas include autonomic pharmacology, cardiovascular pharmacology, ocular pharmacology, renal pharmacology, exocrine pharmacology, immunopharmacology, neuropharmacology, toxicology, and cancer. Specific areas of interest include drug-receptor interactions, signal transduction, ion channel function, and molecular and tissue system approaches to studying receptors, signaling and gene function. It is important to note that the interdisciplinary nature of pharmacology offers the student a broad range of options for research endeavors.

Faculty

Professors: Abel, Bertoni, Dowd, Khan, Makoid, Murray, Petty, Petzel, Reidelberger, Roche;
Associate Professors: Alsharif, Cerutis, Dunlay, Jeffries, Norton, Scofield, Smith, Tu, Opere;
Assistant Professors: Bockman, David.

Admission Requirements

The applicant must possess a baccalaureate degree from an accredited college or university. The Graduate Record Examination (GRE) must be taken. Generally, an overall undergraduate grade-point average (GPA) of 3.0 or higher in sciences, and a combined GRE score above 1000 are required. Undergraduate courses in biology, general chemistry, organic chemistry, biochemistry, mathematics and physics are required. Isolated deficiencies may be made up in the graduate program. However, before a student starts research, these courses have to be completed with an overall GPA of 3.0 or higher.

The Graduate School requires all students from countries in which English is not the native language to demonstrate competence in English by a score of 550 in the TOEFL (Test of English as a Foreign Language) examination or 80 on the Internet-based Test (iBT) at the graduate level.

General Requirements

For the Ph.D. degree at least 90 semester hours of graduate credit are required. Usually, 45 hours are obtained in course work, 25 are earned by independent research, and 20 are acquired in preparing the doctoral dissertation. To qualify for the M.S. degree in pharmaceutical sciences, the student must earn at least 30 semester hours of graduate credit beyond the baccalaureate. The student must maintain a B (3.0) average throughout the graduate program, with no more than six credits with a grade of C.

Special Requirements

Special requirements include PHR631 and PHR632 –Medical Pharmacology I and II, PHR711 –Receptor and Molecular Pharmacology, and PHR717—Molecular Biology in Pharmacology

- PHR 531 Chemical Basis of Drug Action I (3) I**
The chemical basis for drug action *in vivo* and *in vitro*. General chemical principles, physiochemical properties and drug-receptor interactions are used to derive structure-activity relationships for important drug classes permitting the understanding of the pharmacological and biopharmaceutical profiles of currently available drug products. Provides a basis for predicting biological properties and activities of future products. This course was formerly titled “Medicinal Chemistry I.” **P: IC.**
- PHR 532 Medicinal Chemistry II (3) II**
Continuation of PHR 531. **P: DC.**
- PHR 537 Rational Drug Design and Discovery (2) I, OD**
Scientific basis for the rational design and development of new drug molecules. Discussion of drug-receptor theory, structure activity relationships, and specific examples of the design of new drugs. **P: DC.**
- PHR 595 Directed Independent Study (1-5) I, II, S (OD)**
Supervised independent projects that may include laboratory work, assigned readings, research papers, etc. Available in autonomic pharmacology, cardiovascular pharmacology, exocrine pharmacology, and neuropharmacology. **P: Undergraduate or graduate stdg. and DC.**
- PHR 597 Directed Independent Research (1-4) I, II, S (OD)**
Supervised independent research for motivated students to become involved in ongoing original research projects of the pharmacology faculty. **P: Undergraduate or graduate stdg. and DC.**
- PHR 631 Medical Pharmacology I (5) I**
Human pharmacology and therapeutics. Lectures, conferences, and demonstrations.
- PHR 632 Medical Pharmacology II (5) II**
A continuation of Medical Pharmacology I.
- PHR 711 Receptor and Molecular Pharmacology (3) II, OD**
Exhaustive treatment of receptor and molecular pharmacology that considers historical development of concepts, radioligand receptor binding, drug-receptor interactions, receptor characterization and isolation, and signal transduction. **P: DC.**
- PHR 715 Advanced Pharmacology (3) II, OD**
Discussion of recent advances in the pharmacology of cardiovascular, autonomic and central nervous systems. Comprehensive review of drug classes including discussions on possible mechanisms by which drugs produce functional effects in these systems. **P: Gr. stdg.; PHR 631; or DC.**

- PHR 717 Molecular Biology in Pharmacology (2) I, OD**
A survey course in molecular biology and relevant techniques. The course is geared to pharmacologists and others in medical and scientific fields seeking fundamental knowledge of this area. The goal is to provide an understanding of the theoretical and practical aspects of molecular biology for use in research. **P: DC.**
- PHR 750 Research Discussions in Pharmacology (1) I, II**
Students will meet with their course director once weekly to discuss laboratory research topics as assigned by the course director. Topics will usually be pertinent to the research activity of the course director. Instruction will be given through a combination of didactics, small group sessions, student presentations and independent study. **P: DC**
- PHR 760 Research Rounds in Pharmacology (1-3) I, II**
This course will teach students how to formally present their research progress and results, and will provide students with frequent feedback by faculty members and fellow students. This course is repeatable up to 9 credits. **P: DC.**
- PHR 790 Research Methods in Pharmacology (1-5) I, II, S (OD)**
Laboratory rotations in which graduate students perform or observe methods used in pharmacological research. The value of the method and its application to the research efforts of the pharmacology faculty are described in detail. **P: DC.**
- PHR 791 Pharmacology Seminar (1) I, II**
Seminar in selected subjects for pharmacology graduate students. This course is repeatable. **P: DC.**
- PHR 794 Special Topics in Pharmacology (1) I, II, S**
P: DC.
- PHR 795 Directed Independent Study (1-6) I, II, S**
P: DC.
- PHR 797 Master's Directed Independent Research (Credit by arrangement) I, II, S**
Supervised original research. **P: DC.**
- PHR 799 Master's Thesis (1-6) I, II, S**
Review of the literature and research data; writing of the thesis. Student must register for this course in any term when engaged in formal preparation of the Master's thesis; however, six credit hours are the maximum applicable toward the degree. **P: DC.**
- PHR 897 Doctoral Directed Independent Research (Credit by arrangement) I, II, S**
Supervised original research. This course is repeatable up to 9 credits. **P: DC.**
- PHR 899 Doctoral Dissertation (1-6) I, II, S**
This investigative work is the principal area of research carried out by the candidate during doctoral studies. It is conducted under the direct supervision of the candidate's major advisor and dissertation committee in preparation for the doctoral dissertation. Twenty credit hours are the maximum applicable toward the degree. Students will register for this course during formal preparation of the doctoral dissertation. **P: PHR 897.**