

PROGRAM DESCRIPTION

The goal of the graduate program in Pharmaceutical Sciences at Texas Southern University College of Pharmacy and Health Sciences is to offer broad-based education to prepare independent and creative scientists with skills in drug discovery, drug development, and pharmacogenomics leading to the M.S. and Ph.D. degrees. Our graduates will be equipped with the knowledge and skills needed to direct the discovery, development, and delivery of medications for safe and effective therapy. The knowledge and skills acquired through the program will prepare graduates for careers in research and/or teaching positions in academia, the pharmaceutical industry, and in a government agency.

The research interests of the graduate faculty in the Department of Pharmaceutical Sciences include the areas of biopharmaceutics, drug delivery systems, physical pharmacy, neuroscience, molecular and biochemical pharmacology, and pharmaceutical chemistry. The College of Pharmacy and Health Sciences is currently ranked 30th among 64 Colleges of Pharmacy in the U.S. in the total amount of research funding received from NIH and other government agencies. The graduate curriculum includes core courses in physical pharmacy, biopharmaceutics, pharmacokinetics, drug metabolism, and a series of specialized graduate courses in molecular pharmacology, genetics and pharmacogenomics, drug delivery, and methods in pharmaceutical research. Through dissertation research, the candidate will acquire expertise in a chosen field of specialization such as pharmacokinetics, pharmacodynamics, drug metabolism, polymer-based drug delivery, molecular pharmacology, or pharmacogenomics.

ADMISSION STANDARDS

Applicants to the Master or Doctoral degree programs in Pharmaceutical Sciences must meet the admission requirements of the Graduate School. All applicants must hold the bachelor's degree in the natural or health sciences. Specific requirements for admission to the program include an acceptable combined score on the Graduate Record Examination and an acceptable score in a specialty graduate examination (biology or chemistry), acceptable cumulative undergraduate G.P.A. or a cumulative undergraduate G.P.A. within the last sixty undergraduate hours or acceptable cumulative G.P.A. in graduate work, and equivalent quantitative and qualitative measures indicating academic performance acceptable to the graduate admissions committee. Socioeconomic factors will also be used to determine applicant's admission status. International students, in addition to the above requirements, must meet the English Proficiency requirements of the Graduate School.

All applicants admitted to the doctorate program must present credits equivalent to required courses within the masters program in pharmaceutical sciences. Additional determinants of a doctoral candidate will include review of applicants' masters thesis, letters of recommendation, and career objectives by the program admissions committee.

CORE FACULTY

NAME	EDUCATION	RESEARCH INTEREST
Clement, Jade Q. Assistant Professor Biological Chemistry	M.D., Shandong Medical University M.S., Chinese Academy of Preventive Medicine Ph.D., University of Texas at Houston	<ul style="list-style-type: none"> • Functional genomics, gene expression, and molecular genetics • Molecular toxicology and environmental health
Hayes, Barbara E. Associate Professor Pharmacology	B.S., Texas Southern University M.S., Purdue University Ph.D., University of Houston	<ul style="list-style-type: none"> • Molecular and cellular mechanism in pathogenesis of diabetes
Jadhav, Arun L. Professor Pharmacology	B.S., M.S., University of Poona Ph.D., Loyola University	<ul style="list-style-type: none"> • Central mechanisms in bio-behavioral and cardiovascular regulations
Liang, Dong Associate Professor Pharmaceutics	B.S., M.S., Zhejiang Medical University Ph.D., University of Houston	<ul style="list-style-type: none"> • Pharmacokinetics, drug-drug interaction, and drug metabolism. • Sustained-release drug delivery system
Mehta, Chander S. Professor Pharmacology	B.S., University of Bombay B.Pharm., Ph.D., Washington State University	<ul style="list-style-type: none"> • Neurotoxicity of various organic solvents, synthetic chemicals, and environmental pollutants at molecular level.
Milton, Shirlette G. Associate Professor Pharmaceutical Chemistry	B.S., Texas Southern University M.S., Ph.D., University of Texas	<ul style="list-style-type: none"> • Molecular mechanisms in signal transductions.
Oyekan, Adebayo O. Professor Pharmacology	D.V.M., University of Ibadan, Nigeria Ph.D., University of London	<ul style="list-style-type: none"> • Hormonal regulation in the pathogenesis of cardiovascular diseases.

ADMISSION REQUIREMENTS

Masters Degree Program

The primary objective of the Masters degree program is to train students for mid-level positions and pursuit of advanced degrees (Ph.D.) in pharmaceutical sciences. Specialization with two specific tracks, i.e., 1) Pharmacology, and 2) Pharmaceutics will be offered at the M.S. degree level.

To undertake work leading to the Masters degree in Pharmaceutical Sciences, students must be accepted by the Texas Southern University Graduate School. The decision to admit a student will be made by the Dean of the Graduate School upon recommendation from the Program Director. In addition to the general requirements for admission to the graduate school, each applicant will be requested to submit the following:

1. The departmental application supplement, which will include student information sheet and an educational summary.
2. Statement of Purpose
3. Three letters of recommendation
4. College and/or University transcripts
5. Scores on the Graduate Record Examination General Test must be submitted by all applicants (including international applicants). Scores on the Test of English as a Foreign Language (TOEFL) must be submitted by all applicants whose native language is not English.

The following are some factors that maybe included in the socioeconomic profile used in the admission process.

- a. Economic status of family when applicant was in elementary, secondary, and undergraduate school.
- b. Applicant was first generation to attend undergraduate school.
- c. Applicant was first generation to attend graduate or professional school.
- d. Applicant is multi-lingual.
- e. Applicant was employed while attending undergraduate school.
- f. Applicant helped to raise other children in family.
- g. Geographic residence in Texas of applicant at time of application.
- h. Geographic region in which applicants high school is located.
- i. Applicant demonstrated performance in community activities.
- j. Applicant has demonstrated commitment to a particular field of study.
- k. The presence of role models with comparable graduate school training in the applicant's region of residence.

Ph.D. Degree Program

The primary objective of the Ph.D. degree program is to train students for advanced positions in pharmaceutical sciences. Specialization with two specific tracks, i.e., 1) Pharmacology, and 2) Pharmaceutics will be offered for the Ph.D. degree.

Admission to the Ph.D. in Pharmaceutical Sciences program will be granted to a small group of students each year, selected from those who will be judged most likely to achieve eminence in the field. Applicants must hold a master's degree in life-, biomedical-, or health sciences from an accredited college or university before entering. Persons whose native language is not English will be required to demonstrate proficiency in English before enrolling.

1. Applicants for admission to the Ph.D. degree program in Pharmaceutical Sciences must meet the requirements for admission to the Graduate School.
2. Applicants must have an acceptable cumulative grade point average in previous graduate studies.
3. Applicants must present Graduate Record Examination (GRE) General Test scores and an undergraduate grade point average acceptable to the admissions committee. All applicants admitted to the Ph.D. degree program must present credits equivalent to those courses that are required in the Master's program in Pharmaceutical Sciences. Otherwise, they must satisfy those requirements before achieving candidacy status for the Ph.D. degree.
4. All international applicants whose official language is not English, must provide TOEFL score of at least 500 and arrange for the scores to be sent by Educational Testing Service to the graduate school.

DEGREE REQUIREMENTS

M.S. Degree Program

- i. Completion of 40 credit hours of course work.
- ii. Minimum of one presentation at a national research meeting
- iii. Submission of one research paper in indexed-refereed journal
- iv. Successful public defense of thesis

Ph.D. Degree Program

- i. Completion of 74 credit hours of course work.
- ii. Pass the Qualifying Examination
- iii. Pass the comprehensive examination
- iv. Doctoral Candidacy:
 - a. Be admitted unconditionally to the Doctor of Philosophy in Pharmaceutical Sciences degree program.
 - b. Satisfy the residency requirement of two consecutive semesters of full-time residence or an approved equivalence.
 - c. Satisfy the course requirements for the degree program
- v. Oral Public Defense of the Dissertation:
- vi. Publications:
 - d. A minimum of two presentations at national research meetings
 - e. A minimum of one paper published in a peer-reviewed indexed scientific journal
 - f. A minimum of one research paper submitted for publication in a peer-reviewed indexed-refereed journal

CURRICULUM SUMMARY

PHARMACOLOGY TRACK			
Master of Science		Doctor of Philosophy	
Requirements	Semester Credit Hour (Sch)	Requirements	Semester Credit Hour (Sch)
Foundation Courses (Prerequisite/Leveling Courses)		Foundation Courses (Prerequisite/Leveling Courses)	
PAS 535 Pathophysiology III	2	PAS 535 Pathophysiology III	2
PAS 537 Pharmacology & Toxicology I	3	PAS 537 Pharmacology & Toxicology I	3
Courses required of all students (Total of 14 credit hours)		Courses required of all students (Total of 17 credit hours)	
PHS 800 Bioethics	3	PHS 800 Bioethics	3
PHS 801 Biostatistics	3	PHS 801 Biostatistics	3
PHS 802 Seminar/Special Topics/Grantsmanship	1	PHS 802 Seminar/Special Topics/Grantsmanship	1
PHS 803 Seminar/Special Topics/Grantsmanship	1	PHS 803 Seminar/Special Topics/Grantsmanship	1
PHS 814 Laboratory Rotations	3	PHS 814 Laboratory Rotations	3
PHS 809 Pharmacology	3	PHS 808 Pathophysiology	3
		PHS 809 Pharmacology	3
Elective courses (Total 6 credit hours)		Elective courses (Total 9 credit hours)	
PHS 812 Advanced Biochemistry	3	PHS 812 Advanced Biochemistry	3
PHS 913 Molecular Pharmacology	3	PHS 913 Molecular Pharmacology	3
		PHS 904 Genetics and Pharmacogenomics	3
Courses freely selected by students (6 credit hours)		Courses freely selected by students (12 credit hours)	
PHS 808 Pathophysiology	3	PHS 909 Respiratory Pharmacology	3
PHS 901 Cell biology	3	PHS 910 Endocrine Pharmacology	3
		PHS 911 Cardiovascular Pharmacology	3
		PHS 912 Neuropharmacology	3
Other (Research and Thesis, Total 9 credit hours)		Other (Research and Thesis, Total 36 credit hours)	
PHS 815 Master's Research	6	PHS 916 Ph.D. Research	6
PHS 816 Master's Thesis	3	PHS 917 Ph.D. Research	6
		PHS 918 Ph.D. Dissertation	12
		PHS 919 Ph.D. Dissertation	12
Total required for the M.S. degree	40	Total required for the Ph.D. degree	74

PHARMACEUTICS TRACK			
Master's of Science		Doctor of Philosophy	
Requirements	Semester Credit Hour (Sch)	Requirements	Semester Credit Hour (Sch)
Foundation Courses (Prerequisite/Leveling Courses)		Foundation Courses (Prerequisite/Leveling Courses)	
PAS 535 Pathophysiology III	2	PAS 535 Pathophysiology III	2
PAS 537 Pharmacology & Toxicology I	3	PAS 537 Pharmacology & Toxicology I	3
Courses required of all students (Total of 15 credit hours)		Courses required of all students (Total of 17 credit hours)	
PHS 800 Bioethics	3	PHS 800 Bioethics	3
PHS 801 Biostatistics	3	PHS 801 Biostatistics	3
PHS 802 Seminar/Special Topics/Grantsmanship	1	PHS 802 Seminar/Special Topics/Grantsmanship	1
PHS 803 Seminar/Special Topics/Grantsmanship	1	PHS 803 Seminar/Special Topics/Grantsmanship	1
PHS 814 Laboratory Rotation	3	PHS 814 Laboratory Rotation	3
PHS 810 Physical Pharmacy	3	PHS 810 Physical Pharmacy	3
		PHS 908 Advanced Drug Delivery Systems	3
Elective Courses (Total of 6 credit hours)		Elective Courses (Total of 9 credit hours)	
PHS 811 Pharmacokinetics	3	PHS 811 Pharmacokinetics	3
PHS 812 Advanced Biochemistry	3	PHS 812 Advanced Biochemistry	3
		PHS 904 Genetics and Pharmacogenomics	3
Courses freely selected by students (Total of 6 credit hours)		Courses freely selected by students (Total of 12 credit hours)	
PHS 906 Advanced Pharmacokinetics	3	PHS 906 Advanced Pharmacokinetics	3
PHS 907 Advanced Pharmaceutics	3	PHS 907 Advanced Pharmaceutics	3
		PHS 901 Cell biology	3
		PHS 900 Biosynthesis and Drug Metabolism	3
Other Research and Thesis (Total of 9 credit hours)		Other (Research and Thesis, Total 36 credit hours)	
PHS 815 Master's Research	6	PHS 916 Ph.D. Research	6
PHS 816 Master's Thesis	3	PHS 917 Ph.D. Research	6
		PHS 918 Ph.D. Dissertation	12
		PHS 919 Ph.D. Dissertation	12
Total required for the M.S. degree	40	Total required for the Ph.D. degree	74

COURSE DESCRIPTIONS

- PHS 800 BIOETHICS (3 cr.hr.)
The role of codes of professional conduct in the recognition, evaluation and resolution of conflicting ethical principles in research is discussed.
- PHS 801 BIOSTATISTICS (3 cr.hr.)
Application of descriptive and inferential statistical principles to data collection, collation, and analysis.
- PHS 802,803 SEMINAR/SPECIAL TOPICS (1 cr.hr. each)
In this course, students critically review research papers and give presentations on contemporary scientific issues. Outstanding scientists give seminars on research topics.
- PHS 804,805 SEMINAR/GRANTSMANSHIP (1 cr.hr. each)
Students review and present contemporary issues in /Pharmaceutical sciences. Basic principles of developing a grant proposal will be covered with emphasis on goals/objectives, plan, data analysis, and budgeting.
- PHS 806 ADMINISTRATION AND THE SCIENCES (3 cr.hr.)
This course covers the elements and effective practice of management and administration, including decision-making processes, policy and program development, and selected aspects of behavior in organizations.
- PHS 807 EXPERIMENTAL DESIGN/INSTRUMENTATION/CLINICAL MEASUREMENTS (3cr.hr.)
The theoretical and practical applications of literature search, statistics, and planning/design to research development are discussed. It prepares students to employ these tools in solving research problems.
- PHS 808 PATHOPHYSIOLOGY (3 cr.hr.)
A discussion of the definition, classification, etiology, diagnosis, course, prognosis, signs, and symptoms of disease conditions.
- PHS 809 PHARMACOLOGY (3 cr.hr.)
This course provides knowledge of all aspects of the interactions of drugs with living tissues with the emphasis on mechanisms of drug action. (Pre-requisite PHS 808, Pathophysiology and PHS 813 Advanced Biochemistry).
- PHS 810 PHYSICAL PHARMACY (3 cr.hr.)
This course covers proteolytic equilibria and buffer solutions, interfacial phenomena and diffusion coefficient, stability kinetics, complexation and protein binding, and polymer science.
- PHS 811 PHARMACOKINETICS (3 cr.hr.)
Processes of absorption, distribution, metabolism and excretion of drugs are discussed. This course also examines the effects of disease, drug dosage forms, and drug doses on therapeutic and toxic responses. (Pre-requisite PHS 810)

- PHS 812 **ADVANCED BIOCHEMISTRY (3 cr.hr.)**
This course explores the mechanisms of action of biological catalysts and effectors with regard to possible means of selective chemotherapeutic control of biological processes.
- PHS 813 **ADVANCED ORGANIC CHEMISTRY (3 cr.hr.)**
This course focuses on the structure and functions of molecules and the application of those parameters to the design and synthesis of organic substances.
- PHS 814 **LABORATORY ROTATION**
This course introduces on-going research projects to students in three laboratories. Students must complete this course before selecting the dissertation advisor.
- PHS 900 **BIOSYNTHESIS AND DRUG METABOLISM (3 cr.hr.)**
This course describes methods employed in the study/synthesis of natural compounds, biotransformation pathways, and the significance of metabolism in the design of new agents.
- PHS 901 **CELL BIOLOGY (3 cr.hr.)**
This course conveys an understanding of the molecular basis of cellular compartmentalization, protein/membrane trafficking, cytoskeleton regulation, molecular motors, cell cycle, cell death, signal transduction, cell-cell and matrix-cell communications.
- PHS 902 **CYTOLOGY (3 cr.hr.)**
This course provides a detailed study of cellular organelles, their physiology, and their role in metabolism and in the development of different diseases. It highlights techniques employed in studying the cell.
- PHS 903 **IMMUNOLOGY (3 cr.hr.)**
This course describes mechanisms of body protection against foreign bodies and antigens. Immunodeficiency syndromes, autoimmunity, allergic responses and vaccine technology are also discussed.
- PHS 904 **GENETICS AND PHARMACOGENOMICS (3 cr.hr.)**
The course describes the biology and physiology of genes. It covers the genetic basis of diseases, drug actions/toxicity, and inter-individual differences in responses to drugs.
- PHS 905 **ADVANCED MEDICINAL CHEMISTRY (3 cr.hr.)**
The emphasis of this course is practical synthetic chemistry useful in the preparation of complex polyfunctional molecules.
- PHS 906 **ADVANCED PHARMACOKINETICS (3 cr.hr.)**
Application of concepts of drug kinetics to the interpretation of pre-clinical and clinical data. Mathematical derivations of the mass balanced relationships involving rate processes and their physiological importance are discussed. (Pre-requisite PHS 811)

- PHS 907 **ADVANCED PHARMACEUTICS (3 cr.hr.)**
 Topics include preformulation pharmaceutical excipients, solid dosage forms, dispersed systems, microencapsulated formulations, controlled release dosage forms and dermatological and biotechnological-derived products.
- PHS 908 **ADVANCED DRUG DELIVERY SYSTEMS (3 cr.hr.)**
 The current practice, rationale and design of novel drug delivery systems, novel drug delivery systems under investigation and future drug delivery technology and systems are presented in this course.
- PHS 909 **RESPIRATORY PHARMACOLOGY (3 cr.hr.)**
 A detailed presentation on the interactions of drugs with the pulmonary system. The molecular basis of drug efficacy in respiratory dysfunctional states will be explored.
 (Pre-requisite PBS 809, Pharmacology)
- PHS 910 **ENDOCRINE PHARMACOLOGY (3 cr.hr.)**
 The impact of drugs on the biosynthesis and mechanisms of action of hormones in regulation of cellular metabolism and expression of physiological effects will be discussed. Research problems in endocrinology will be highlighted. (Pre-requisite PHS 809, Pharmacology)
- PHS 911 **CARDIOVASCULAR PHARMACOLOGY (3 cr.hr.)**
 An in-depth discussion of the basic physiology of the cardiovascular system and all aspects of chemical interactions with the system. Research techniques designed to address cardiovascular problems will be presented. (Pre-requisite PBS 809, Pharmacology)
- PHS 912 **NEUROPHARMACOLOGY (3 cr.hr.)**
 This course will focus on the etiology and development of neurological disease and how drugs, at a molecular level, affect transmission of chemical signals, the brain's signaling system and function as well as pathways of neurological disorders. (Pre-requisite PBS 809, Pharmacology)
- PHS 913 **MOLECULAR PHARMACOLOGY (3 cr.hr.)**
 Course designed to study receptors, signaling, pathways, enzymes, channels, transcriptional mechanisms, and molecular modeling relevant to drug design and drug action.
- PHS 814 **MASTERS RESEARCH**
 Supervised student research on an approved research problem suitable for preparation of a thesis.
- PHS 815 **MASTERS THESIS**
 Supervised research and thesis preparation
- PHS 916 **Ph.D. RESEARCH**
 Supervised research on an approved research problem suitable for the preparation of a dissertation.

- PHS 917 Ph.D. RESEARCH
Supervised research on an approved research problem suitable for the preparation
of a dissertation.
- PHS 918 Ph.D. DISSERTATION
Supervised research and dissertation preparation
- PHS 919 Ph.D. DISSERTATION
Supervised research and dissertation preparation