

PHARMACOLOGY AND TOXICOLOGY (MS)

Master of Science in Pharmacology and Toxicology

Unit: School of Medicine (<http://louisville.edu/medicine/>) (GM)
 Department: Pharmacology and Toxicology (<https://louisville.edu/medicine/departments/pharmacology/>)
 Program Website (<https://louisville.edu/medicine/departments/pharmacology/programs/>)
 Academic Plan Code(s): PHARMS

Program Information

The Department of Pharmacology and Toxicology is committed to academic excellence and to the attainment of regional, national, and international recognition for the quality of its educational, research, and service activities. The Department Strategic Plan includes five broad objectives:

- Provide instruction in pharmacology and toxicology of the highest quality for the education and preparation of medical, dental, and other health care professional students. Emphasis is placed on the fundamental principles necessary for life-long learning and the essential knowledge required for rational, effective, and safe use of drug therapy.
- Advance biomedical knowledge through high quality research and other scholarly activities, particularly in pharmacology and toxicology and other areas of focus within the University of Louisville and School of Medicine Strategic Plans.
- Provide robust research and educational experiences in pharmacology and toxicology for the education and training of future biomedical scientists who will provide and advance biomedical education, research, and service.
- Provide instruction of the highest quality in pharmacology and toxicology appropriate for students at the undergraduate, graduate, and postgraduate levels.
- Provide service to the School of Medicine, the Health Sciences Center, the University of Louisville and the surrounding region, the Commonwealth of Kentucky, professional organizations, the nation, and the world.

Goals of the Program

The Department of Pharmacology and Toxicology is dedicated to advancing biomedical knowledge through active contribution to high-quality research in pharmacology and toxicology and to providing high-quality research and educational experiences for the education and training of future biomedical scientists who advance biomedical education, research, and service.

Admission Requirements

For the Department of Pharmacology and Toxicology, complete guidelines are given below.

Application Forms

All candidates for admission to graduate programs at the University of Louisville must complete a graduate application (<https://louisville.edu/graduate/futurestudents/apply-materials/application/>).

Applications are accepted year-round for start dates of around August 1. However, to ensure full consideration for admission, applications should be submitted by January 15th of the same calendar year. All credentials and/or communications should be submitted to the Graduate School and must include the applicant's full name and University of Louisville-issued student ID (if available). In rare and special cases, provisional admission may be granted even if some application materials are incomplete. Please contact the department (phtxapps@louisville.edu) for additional information.

Application Fee

A non-refundable application fee is required with the application form. An application will not be forwarded to the department until this fee is paid.

Transcripts

Applicants for admission to a degree program must submit an official transcript from each college attended. All University of Louisville transcripts will automatically be submitted with completion of an application. All applications are considered on an individual basis. Normally, a successful applicant will have an undergraduate GPA of 3.00 or higher and will have successfully completed sufficient coursework in biology, chemistry and mathematics.

Statement of Experience and Professional Goals

At the time of application, a 2-3 page typed statement should be sent to introduce the student to the faculty of the Department, describing past educational, laboratory and relevant life experiences, as well as outlining professional goals after the degree program.

This statement can be sent electronically to gradadm@louisville.edu

English Proficiency

1. English Proficiency. All applicants for whom English is a second language must also submit official TOEFL scores of 79 or higher on the internet-based test, official IELTS scores of at least 6.5 overall band score from the academic module exam or official Duolingo overall score of 105. Students holding a bachelor's or advanced degree from an accredited institution in the United States are exempt from this requirement. Information concerning the TOEFL exam can be obtained from: University Testing Center, or Test of English as a Foreign Language PO Box 6151 Princeton, NJ 08541 USA or [toefl.org](http://www.toefl.org) (<http://www.toefl.org>) The institutional code of UofL for TOEFL is 1838. The TOEFL department code is 30 (other biological sciences); IELTS information can be obtained from www.ielts.org (<https://www.ielts.org/>); Duolingo information can be obtained from englishtest.duolingo.com/ applicants (<https://nam11.safelinks.protection.outlook.com/?url=http%3A%2F%2Fenglishtest.duolingo.com%2Fapplicants&data=04%7C01%7Ccheryl.schroader%40louisville.edu%7C0baa30a62e8345914a7c08d9faf80847%7Cdd246e4a54344e158ae391ad97%7CTWFPbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjojV2luMzliLCJBTiI6Ik1haWV%7C3000&sdata=touQ%2Brap6mVG4VBHkhRok5SfbyjKR0NfK0ySeS6clh8%3D&reserved=0>).

Personal Interview

Whenever possible, a personal interview, either in person or via telephone will be held before final offer and acceptance of a position in the MS program.

Letters of Recommendation

A minimum of two letters of recommendation from persons familiar with the applicant's research and/or academic work are required.

International Student Applicants

In addition to meeting the required academic credentials and demonstrating English proficiency, the University of Louisville requires an international credential evaluation for all applicants who have attended colleges, universities, or postsecondary programs outside of the United States. Furthermore, upon admission, international students must provide evidence of sufficient financial resources to cover educational and living expenses throughout their studies. They must also submit a copy of their passport's biographical page as part of the I-20/DS-2019 process. For more details, visit the Graduate School website for international applicants (<https://graduate.louisville.edu/admission/international/>).

Financial Aid

The Department generally does not provide financial support for master's degree students. Current tuition rates (<https://louisville.edu/bursar/tuitionfee/>) can be found on the Office of the Bursar website.

The University of Louisville reserves the right to change programs of study, academic requirements, fees, schedules of courses, the announced academic calendar and deadlines without prior notice.

Program Requirements

The Master of Science in Pharmacology and Toxicology program is a 1.5+ year course of study culminating in the presentation and defense of a master's thesis. The master's thesis may be based on laboratory research, a "dry" library-based research project, or a combination of the two. A non-thesis option is available, offering options in either Pharmacology or Toxicology, subject to the approval of the faculty mentor and Director of the Graduate Program.

The MS curriculum is designed for:

1. Individuals interested in a terminal master's degree who do not require extensive research experience or credentials, e.g., pharmaceutical representatives, medical insurance providers, medico-legal professionals
2. Pairing with other programs to form hybrid or dual science/business or public health degrees, such as an MS/MBA or MS/MPH programs
3. Individuals interested in progressing through management ranks in Pharmacology or biotech businesses
4. The basis for a scientific writing career, when coupled with extensive scientific writing experience or electives
5. The basis for a career in biotechnology, when combined with theoretical and practical training in laboratory analysis

Thesis Option

Course Work

Year 1			
Fall			Hours
PHTX 641	Principles of Pharmacology		3
PHTX 643	Environmental Toxicology		3
BIOC 645	Advanced Biochemistry I		4
PHZB 602	Physiological Concepts for General Life Sciences		2
Co-curricular:			

PHTX 606	Seminar	1
PHTX 617	Laboratory Rotation Research	1
Hours		14
Spring		
PHTX 642	Principles, Applications, and Research Methods in Pharmacology	3
PHTX 644	Organ Toxicology	3
BIOC 667	Cell Biology	3
BIOC 630	Responsible Conduct of Research: Survival Skills and Research Ethics	1
Co-Curricular:		
PHTX 619	Research	1
PHTX 606	Seminar	1
Hours		12
Summer		
PHTX 619	Research	4
PHTX 632	Analysis of Parametric & Non-parametric Data	2
Hours		6
Year 2		
Fall		
PHTX 625	Scientific Writing	2
Electives		0-4
Co-curricular:		
PHTX 619	Research	5-6
PHTX 606	Seminar	1
Hours		8-13
Spring		
Master's Candidacy		
Preparation, presentation, and defense of Master's thesis and award of MS degree (if required)		
Hours		0
Minimum Total Hours		40-45

Advisor Selection and Master's Thesis Committee Formation

During the first semester, students are required to visit research laboratories of potential Principal Advisors who hold primary or secondary appointments in the Department of Pharmacology and Toxicology and whose research aligns with the students' interests. Faculty must hold Graduate Research Training Faculty status to serve as a sole advisor. The master's thesis committee must consist of at least three qualified members, including at least one primary faculty member from the Department of Pharmacology and Toxicology. The selection of the Research Advisor and the formation of the thesis committee require approval from the Director of Graduate Studies, the Department Chair, and the Associate Dean for Graduate and Postdoctoral Studies in the School of Medicine.

Minimum Program Requirements

To complete the MS degree, students must maintain good standing in the Pharmacology and Toxicology graduate program by meeting the following requirements: 1) Successfully complete all coursework with a minimum GPA of 3.0, with no grades of C or below; 2) Deliver an annual seminar presentation; 3) Submit an annual progress report; and 4) Regularly attend weekly departmental seminars. The thesis committee must meet at least once a year to evaluate the student's progress. To be eligible for Master's candidacy, students must complete a minimum of 40 credit hours by the end of their second year. The MS degree must be completed within 6 years from the start of the program. Coursework older than 6 years, including transfer credits, will not count toward the degree.

Master's Thesis Examination

Students pursuing the thesis option must complete a body of research and write a master's thesis, which they will publicly defend. The thesis must be approved by both the thesis committee and the Graduate School. The thesis must demonstrate the student's ability to conduct independent research. Students will defend their research protocol, results, and conclusions during an oral Thesis Defense. To pass, no more than one unfavorable vote from committee members is permitted. After the defense, students must complete all required thesis revisions within the same semester and meet the Graduate School's submission deadlines. Once the final, approved thesis is submitted to the Graduate School, degree requirements are fulfilled. For thesis formatting, students should refer to the latest version of the "Guidelines for the Preparation and Processing of Theses and Dissertations (<https://graduate.louisville.edu/graduation-milestones/thesis-and-dissertation/>)". Students are responsible for ensuring compliance with the most current guidelines.

Non-Thesis Option

For information about the non-thesis options in either Pharmacology or Toxicology, see the Non-Thesis Requirements tab.

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The MS curriculum is designed for:

1. Individuals interested in a terminal master's degree who do not require extensive research experience or credentials, e.g., pharmaceutical representatives, medical insurance providers, medico-legal professionals
2. Pairing with other programs to form hybrid or dual science/business or public health degrees, such as an MS/MBA or MS/MPH programs
3. Individuals interested in progressing through management ranks in Pharmacology or biotech businesses
4. The basis for a scientific writing career, when coupled with extensive scientific writing experience or electives
5. The basis for a career in biotechnology, when combined with theoretical and practical training in laboratory analysis

Non-Thesis Option I: Focus in Pharmacology

Fall		Hours
BIOC 645	Advanced Biochemistry I	4
PHTX 643	Environmental Toxicology (optional) ¹	3
PHTX 641	Principles of Pharmacology	3
PHZB 602	Physiological Concepts for General Life Sciences	2
PHTX 617	Laboratory Rotation Research	1
PHTX 606	Seminar	1
Hours		14
Spring		
PHTX 644	Organ Toxicology (optional) ¹	3
BIOC 667	Cell Biology	3
PHTX 642	Principles, Applications, and Research Methods in Pharmacology	3

BIOC 630	Responsible Conduct of Research: Survival Skills and Research Ethics	1
PHTX 619	Research	5-7
PHTX 606	Seminar	1
Hours		16-18
Summer		
PHTX 632	Analysis of Parametric & Non-parametric Data	2
PHTX 619	Research	4
Hours		6
Minimum Total Hours		36-38

Non-Thesis Option II: Focus in Toxicology

Fall		Hours
BIOC 645	Advanced Biochemistry I	4
PHTX 643	Environmental Toxicology	3
PHTX 641	Principles of Pharmacology (optional) ¹	3
PHZB 602	Physiological Concepts for General Life Sciences	2
PHTX 617	Laboratory Rotation Research	1
PHTX 606	Seminar	1
Hours		14
Spring		
PHTX 644	Organ Toxicology	3
BIOC 667	Cell Biology	3
PHTX 642	Principles, Applications, and Research Methods in Pharmacology (optional) ¹	3
BIOC 630	Responsible Conduct of Research: Survival Skills and Research Ethics	1
PHTX 619	Research	5-7
PHTX 606	Seminar	1
Hours		16-18
Summer		
PHTX 632	Analysis of Parametric & Non-parametric Data	2
PHTX 619	Research	4
Hours		6
Minimum Total Hours		36-38

¹ Students in the non-thesis option who elect to take optional courses in either concentration may reduce the number of total credits taken in PHTX 619, as long as they meet the minimum 30 credit hours required for the degree.

Advisor Selection

During the first semester of their graduate study, students are required to visit research laboratories of potential Principal Advisors who hold primary or secondary appointments in the Department of Pharmacology and Toxicology and align with their interests. The Director of Graduate Studies will serve as a Temporary Advisor until a Permanent Advisor is selected. Students must select a Principal Advisor within the first semester. The selection process involves approval by the student, the Principal Advisor, the Director of Graduate Studies, and the Department Chair.

Minimum Program Requirements

At least 30 credit hours beyond the Baccalaureate Degree are required for the degree of Master of Science. A student must maintain at least a 3.0 accumulated GPA. In general, a student with a GPA that is less than 3.0 at the end of the second semester will require a 2/3 majority vote of the Departmental faculty to continue in the Program. A student may not

be graduated with more than six (6) credit hours of "C" grades in their required courses.

Final Examination

Students are required to take a Final Examination during the last semester of the MS Program. This exam will take the form of a research paper or a literature review paper, plus a final oral exam. A positive recommendation for the Master of Science Degree shall require a majority vote of the Final Examination Committee (consisting of at least the Principal Advisor who will serve as Chair and two additional members of the Graduate Faculty). The Committee must have been approved by the Director of Graduate Studies, the Department Chair, and the Dean of the School of Medicine (or his/her designee) prior to the Final Examination. This recommendation shall be made at least one week before graduation.