The School of Pharmacy faculty is composed of three divisions: Pharmaceutical Sciences, Pharmacology & Toxicology and Pharmacy Practice. This Handbook describes the activities of the Division of Pharmacology & Toxicology in directing education leading to the Doctor of Philosophy (Ph.D.) degrees.

**Doctor of Philosophy (Ph.D.) Degree**

Study towards the Ph.D. at UMKC is governed and administered through the School of Graduate Studies. The Ph.D. program at UMKC is interdisciplinary. It enables a graduate student to design a unique program of didactic and laboratory coursework and dissertation research. The Interdisciplinary Ph.D. student must select a coordinating discipline and one or more co-disciplines upon application. Such a student must satisfy the admission requirements of all the disciplines selected. Pharmacology & Toxicology is recognized as one of the Disciplines which may be selected by a prospective graduate student as coordinating discipline, i.e. major, or a co-discipline, i.e. minor. This Handbook provides a supplement to the information on requirements for graduate degrees in the University of Missouri-Kansas City General Catalog and the School of Graduate Studies handbook, titled "Academic Regulations and Information for Doctor of Philosophy (Ph.D.) Studies at the University of Missouri-Kansas City" and any amendments thereof.

*Students must adhere to all stipulations of the University for the Degree sought. Nothing in this description shall be construed to be in conflict with policies of the University.*

**Admission Requirements for Graduate Study in the School of Pharmacy**

All applications to graduate programs in the School of Pharmacy must be made through the UMKC Admissions Office. An applicant must meet the general requirements of the University to be considered by the School of Pharmacy. All applications are reviewed and must be approved by the Division of Pharmacology & Toxicology and by the School of Graduate Studies. Applicants to the UMKC Interdisciplinary Ph.D. program must be accepted by the Primary Discipline and the Co-discipline(s) selected. Admission to the graduate program in Pharmacology & Toxicology is contingent on the ability of the graduate faculty to accept additional graduate students and the availability of both space and funding. Thus, worthy candidates may not be accepted for lack of a match in student and faculty interests and faculty availability or logistic considerations.

Applicants must submit the following documentation:

1. A professional degree or a baccalaureate degree in a related field such as chemistry, biology, or biomedical sciences.
2. An aggregate minimum grade point average (GPA) of 3.0 for those graded on a 4.0 basis or equivalent undergraduate achievement for others. (A prospective faculty advisor may require more stringent standards in an emphasis area)
4. Graduate Record Examination (GRE) scores. With the new scoring system this would correspond to 148 for Verbal and 147 for Quantitative; or a combined score of 295 and a 3.0 Analytical score.
5. For students whose primary language is not English, submission of scores obtained in the Test of English as a Foreign Language (TOEFL). A candidate must have a minimum score on the TOEFL 550 (paper-based), 213 (computer-based) or 80 (internet-based). Alternatively a score of 6.0 on IELTS would be acceptable.
6. Foreign students must meet financial independence criteria established by the University.

**Full and Provisional Admission.** Graduate students in the Interdisciplinary Ph.D. program will be admitted provisionally until they have satisfactorily completed two semesters of graduate study. Students will receive full admission only after receiving B or better grade during first two semesters. Graduate students who hold a M.S. degree in Pharmacology or Toxicology usually receive full admission.

**Faculty Advisors.** On admission, all students are assigned an Interim Faculty Advisor as stated in the letter of admission. By the end of the first year, each student should have completed two or more laboratory rotations and selected a permanent advisor. If the permanent advisor sought is not same as the interim advisor, the student must confirm acceptance in writing by the desired permanent advisor and submit appropriate paperwork to the School of Graduate Studies. Each student must have a faculty advisor throughout his/her graduate studies.

If a student changes to another faculty member in the Division of Pharmacology & Toxicology then any support from Division or School e.g. GTA, resources will transfer with the student. Resources from individual professors are at the discretion of such professors. The advisor from whom the student is transferring has the rights to all previous project(s) worked on by the student, and all research ideas, grant proposals etc. originating from that work. That advisor must grant permission in writing for the student to use any such material for a meeting presentation, publication, patent, thesis or dissertation.

If a student wishes to change permanent advisors, a meeting will be held between the student and the two advisors. If a conflict arises, then the meeting maybe mediated by the chairman or third-party division faculty when the chairman is one of the two advisors.

**Enrollment as a Non-degree Seeking Graduate Student**
Students who have baccalaureate degrees in an appropriate field may enroll for as many as 12 credits in graduate courses without having been admitted to the graduate programs in the School of Pharmacy. It is recognized by the Faculty that some students may not have achieved the grade point average as undergraduates or GRE scores necessary for full admission into graduate study. Some students, through work experience and maturity, may have more ability than is demonstrated in their undergraduate records. Students who have achieved a minimum of a B-grade in not fewer than 6 credits of graduate study in this School may apply for provisional admission to the graduate programs in Pharmacology & Toxicology. Provisional admission requires that the student must have obtained the agreement of a member of the Graduate Faculty to serve as Advisor and the approval of the Graduate Programs Committee.

*In no case will graduate credit of more than 12 credit hours be transferable to a degree program.* Enrollment in any School of Pharmacy course requires approval of the Graduate Programs Committee of the School of Pharmacy.

**Annual Evaluations and Graduate Files**
Upon enrolling the interdisciplinary Ph.D. program, each graduate student is required to complete and submit an annual evaluation form to the School of Graduate Studies at the end
of each Spring Semester (May). This is a form that is provided on the SGS website and is completed by and signed by the student and coordinating advisor as well as their co-discipline advisor.

A requirement by the Pharmacology & Toxicology division is that each graduate student is to submit a copy of their evaluation to include in their student files. Additionally, the student should submit current curriculum vitae on file along with copies of pertinent information related to their progress through the graduate program. These key items are listed below:

- Curriculum vitae including current contact information
- Annual evaluations
- GTA and/or GRA assignments
- Fellowship/scholarship awards
- Copies of publications, abstract notices, etc.
- Copies of any documents submitted to the SGS as part of their program, i.e., plan of study, comprehensive examination, etc.

These graduate files are kept locked in the Pharmacology & Toxicology division office and are kept in accordance with FERPA regulations.

Financial Aid
The School of Pharmacy cannot guarantee financial aid on admission; however, the Faculty makes every effort to provide some form of aid to graduate students making satisfactory progress, including:

1. University of Missouri-Kansas City Chancellor's Nonresident Fellowship which provide remission for out-of-state tuition; instate tuition costs are still incurred.
2. Graduate Teaching Assistantships (GTAs) and Graduate Research Assistantships (GRAs) which depend on the needs of the Faculty. University of Missouri policy dictates that foreign students whose primary language is not English cannot be considered for GTAs during their first semester of enrollment in graduate study.
3. Fellowships sponsored by industry, government or non-profit organizations such as the American Heart Association or the American Foundation for Pharmaceutical Education. These usually confer a stipend and remission of tuition.

Refer to the Graduate Studies section of the General UMKC catalog for other sources of support.

General Coursework Requirements
All graduate students must satisfy requirements which include credits in Statistics (EDUC-R&P5505) and Seminar (Pharmacy 5580C) as well as Dissertation (PHAR 5699C) credits. Those students without a degree in pharmacy are advised to elect introductory graduate courses in pharmacology/toxicology.
### Pharmacology & Toxicology Courses

<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credit/hours</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHAR 5509</td>
<td>Basic Toxicology</td>
<td>3</td>
<td>Spring</td>
</tr>
<tr>
<td>PHAR 5519</td>
<td>Pharmacology I</td>
<td>2</td>
<td>Spring</td>
</tr>
<tr>
<td>PHAR 5520</td>
<td>Pharmacology II</td>
<td>4</td>
<td>Fall</td>
</tr>
<tr>
<td>PHAR 5530</td>
<td>Pharmacology III</td>
<td>4</td>
<td>Spring</td>
</tr>
<tr>
<td>PHAR 5580C</td>
<td>Seminar in Pharmacology &amp; Toxicology¹</td>
<td>1</td>
<td>Fall and Spring</td>
</tr>
<tr>
<td>PHAR 5615</td>
<td>Research Methods in Pharmacology &amp; Toxicology</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>PHAR 5690C</td>
<td>Special Topics Pharmacology &amp; Toxicology</td>
<td>1-3</td>
<td>Fall and Spring</td>
</tr>
<tr>
<td>PHAR 5699C</td>
<td>Research and Dissertation;</td>
<td>1-6</td>
<td>Fall and Spring</td>
</tr>
</tbody>
</table>

### Other Courses

<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credit/hours</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHAR 5630</td>
<td>Cytochrome P450: Drug Metabolism Bioavailability, Interactions and Toxicity</td>
<td>3</td>
<td>Fall</td>
</tr>
<tr>
<td>MEDB5561</td>
<td>Responsible Conduct in Research</td>
<td>3</td>
<td>online</td>
</tr>
<tr>
<td>EDUC-R&amp;P5505</td>
<td>Statistics</td>
<td>3</td>
<td>Fall and Spring</td>
</tr>
<tr>
<td>PHAR 5633</td>
<td>Receptor Pharmacology &amp; Signal Transduction</td>
<td>3</td>
<td>Spring, odd</td>
</tr>
<tr>
<td>PHAR 5560</td>
<td>Discussions in Pharmacology</td>
<td>1</td>
<td>Fall and Spring</td>
</tr>
</tbody>
</table>

Some courses offered by the division of Pharmaceutical Sciences may be appropriate electives. These are listed below:

### Pharmaceutical Sciences Courses

<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credit/Hours</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHAR 5521</td>
<td>Advanced Organic Medicinal Chemistry</td>
<td>3</td>
<td>Spring, even</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Fall, odd</td>
</tr>
<tr>
<td>PHAR 5527</td>
<td>Analytical Methods;</td>
<td>3</td>
<td>Fall, odd</td>
</tr>
<tr>
<td>PHAR 5533</td>
<td>Advanced Pharmacokinetics &amp; Biopharmaceutics</td>
<td>3</td>
<td>Fall, even</td>
</tr>
<tr>
<td>PHAR 5588</td>
<td>Techniques in Biotechnology</td>
<td>3</td>
<td>Spring, odd</td>
</tr>
<tr>
<td>PHAR 5631</td>
<td>Drug Product Design &amp; Regulatory Affairs</td>
<td>3</td>
<td>Spring, even</td>
</tr>
<tr>
<td>PHAR 5632</td>
<td>Novel Drug Delivery Systems;</td>
<td>3</td>
<td>Spring, odd</td>
</tr>
</tbody>
</table>
PHAR 5634 Protein & Nucleic Acid Drug Delivery  3  Fall, even
PHAR 5690A Foundations of Pharmaceutical Sciences 1-3 Fall

Generally, graduate students electing Pharmacology & Toxicology as coordinating discipline are required to select five graduate courses from Pharmacology & Toxicology. Graduate students electing Pharmacology & Toxicology as co-discipline are required to take at least three of the courses listed above. Depending upon the needs of the graduate student, other appropriate graduate courses are available in the Department of Oral Biology, the School of Biological Sciences and other schools and departments of the university.

Special Requirements
Graduate students in Pharmacology & Toxicology will have completed coursework in calculus, organic chemistry, physical chemistry, biochemistry, microbiology, human anatomy and physiology, where appropriate to their interests. These courses may be taken in University Departments and Schools outside the School of Pharmacy. Because many courses have prerequisites, the sequence of recommended core courses is determined by the academic background of each student and requires the concurrence of the faculty advisor. Graduate students in the Pharmacology & Toxicology may be required to take examinations based on undergraduate courses to determine if additional courses are necessary.

Time Required
A student enrolled as a full-time student may elect 9-12 credit hours each semester. Credit more than seven years old at the time of graduation that is included on the program of study and has not been applied to a previous degree may not be counted toward the fulfillment of a graduate degree program unless validated to the satisfaction of the department or school and the School of Graduate Studies. Petitions and affidavits for this purpose may be obtained from the School of Graduate Studies.

The Interdisciplinary Doctor of Philosophy (Ph.D.) Degree
The Doctor of Philosophy degree is the highest academic degree offered in any American university. The Ph.D. is a research degree. Merely attaining high grades in didactic coursework and passing examinations is insufficient demonstration of worthiness for this degree. Achievement of it requires demonstration of the highest order of scholarship, diligent and inventive pursuit of a research program and defense of a dissertation based on this original research. The Ph.D. usually is a requirement for obtaining appointment to University faculties or to senior-level appointments in research and development in pharmaceutical and related industry, research institutes and in government.

Requirements for the Ph.D. Degree: Ph.D. programs at UMKC are interdisciplinary. Students desiring to study at the doctoral level in Pharmacology & Toxicology must apply to the School of Graduate Studies. Detailed information on the general and discipline specific admission requirements may be found in the School of Graduate Studies handbook titled "Academic Regulations and Information for Doctor of Philosophy (Ph.D.) Studies at the University of Missouri-Kansas City" and any amendments thereof.
Discipline-Specific Requirements for Pharmacology & Toxicology:
Courses (Credit Hours)

Required Courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHAR 5519</td>
<td>Pharmacology I-</td>
<td>2</td>
</tr>
<tr>
<td>PHAR 5520</td>
<td>Pharmacology II-</td>
<td>4</td>
</tr>
<tr>
<td>PHAR 5530</td>
<td>Pharmacology III-</td>
<td>4</td>
</tr>
<tr>
<td>PHAR 5615</td>
<td>Research Methods in Pharmacology &amp; Toxicology-</td>
<td>3</td>
</tr>
<tr>
<td>PHAR 5580C</td>
<td>Seminar (PHAR 5580C)-</td>
<td>3</td>
</tr>
<tr>
<td>PHAR 5509</td>
<td>Toxicology-</td>
<td>3</td>
</tr>
<tr>
<td>EDUC-R&amp;P 5505</td>
<td>Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

Co-discipline and Electives:

Coursework in co-discipline and other areas  8 credits
Other PHARM graduate courses  5 credits

Research course:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHAR 5699C</td>
<td>Research and Dissertation</td>
<td>20</td>
</tr>
</tbody>
</table>

Total Credits  55

Ph.D. Supervisory Committee: The Committee comprises the faculty advisor and four other faculty members who hold appointments to the UMKC Doctoral Faculty. At least one of the members of the Ph.D. Supervisory Committee, in addition to the faculty advisor who serves as Chair, is a member of the Pharmacology & Toxicology faculty and at least one member represents the co-discipline(s) selected. The Committee is recommended by the faculty advisor and approved by the Graduate Programs Committee and the School of Graduate Studies. The Supervisory Committee should meet with the student on an annual basis and are responsible for approving the research proposal and program of study submitted by the student.

Written and Oral Examinations
Students may be required to complete a written placement test based on the undergraduate curriculum in areas of pharmacy, biology and chemistry, usually during their first year. The Co-discipline may require an additional written examination. Students are required to pass any divisional exams before appearing for their comprehensive exams administered by the Supervisory Committee.

Within the first three years after full-admission, the student will undergo a comprehensive examination by the Supervisory Committee; this will consist of both written and oral examination sections. If a student does not pass the first time, they may retake the exam as a second attempt to pass. Passing comprehensive oral and written examinations given by the Supervisory Committee is necessary before a student can be admitted to candidacy for the Ph.D. degree. Grading on these examinations is "pass-fail". A judgment of "pass" must be obtained from all or all but one member of the Supervisory Committee. A report of the results of the examination is provided to the Graduate Programs Committee and the School of Graduate Studies.
A research proposal (plan of study) must be submitted to the Supervisory Committee and the School of Graduate Studies within three years after a student has attained full admission to the program.

After a student has completed a body of research satisfactory to the Supervisory Committee, a dissertation is written describing the work performed. When this has been read by the Supervisory Committee and approved by them, a Dissertation Defense is conducted. Generally, the work is presented as a public seminar, an announcement and abstract of which is provided not less than two weeks before, and it is presented during a regular semester or summer session during school hours. After questions from the audience, further examination and recommendations by the Supervisory Committee are conducted in a closed session. The dissertation must be approved in form and content by the School of Graduate Studies as well as by the student’s Supervisory Committee.

Prior to conferring the Doctor of Philosophy degree, the student must have at least one first author paper on original research accepted by a peer-reviewed journal as well as work with their graduate advisor towards co-authorship of additional publications. These paper(s) should be based on their dissertation project. Additionally, the student must present a poster or podium, based on their research project, at a local, regional, or (inter-)national scientific meeting.

*Pharmacology & Toxicology as Co-Discipline* -- Students choosing Pharmacology & Toxicology as a co-discipline will elect graduate courses in Pharmacology & Toxicology compatible with their research objectives as recommended by the supervisory committee. Generally, 4 courses will be required including Pharmacology I, II, and III (PHARM 5519, 5520, and 5530) and Pharmacology & Toxicology Seminar (PHARM 5580C). Students will not be allowed to attain more than one C or lower grade in co-discipline courses.
Faculty for Division of Pharmacology & Toxicology
The following list is current as of August 2014.

Anil Kumar, Ph.D., Professor & Chairman
Russell Melchert, Ph.D., Professor & Dean
Mostafa Badr, Ph.D.; Professor
Robert Piepho, Ph.D.; Professor Emeritus
Hari Bhat, Ph.D.; Associate Professor
Orisa J. Igwe, Ph.D.; Associate Professor
JianPing Wang, Ph.D.; Associate Professor
Peter Silverstein, Ph.D.; Research Associate Professor

Information on the Interdisciplinary Ph.D. program may be obtained by contacting the UMKC School of Graduate Studies at (816) 235-1611 or 235-1301 (www.umkc.edu/sgs).

For additional information about programs or about the admissions process, contact the following persons:

Dr. Anil Kumar
IPhD Coordinator
Division of Pharmacology & Toxicology
School of Pharmacy, HSB 3255
University of Missouri-Kansas City
2464 Charlotte Street
Kansas City, MO 64108
(816) 235-1792
Fax 816-235-1776

Ms. Sharon Self/Mr. Jason Cross
Office Support Assistant
Division of Pharmacology & Toxicology
School of Pharmacy, HSB 3255
University of Missouri-Kansas City
2464 Charlotte Street
Kansas City, MO 64108
(816) 235-5907/1792
Fax 816-235-1776

Applications should be sent directly to the Office of Admissions/ University of Missouri-Kansas City, 5115 Oak Street, Kansas City, MO 64110. Reference letters and supplemental application should be sent to one of the coordinators at the above address.

International students should request special application packets from:
International Student Affairs Office, 5235 Rockhill Road, Kansas City, MO 64110 816-235-5355 or 816-235-6502 (Fax).

[1] Graduate students in Pharmacology & Toxicology as coordinating discipline in the Interdisciplinary Ph.D. program are required to attend all seminars, with a minimum of three credits.