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Pharmacology and Neuroscience

Graduate courses of study leading to the Master of Arts (M.A.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) degrees in Pharmacology and Neuroscience are offered by Southern Illinois University School of Medicine, Department of Pharmacology. Course offerings in the graduate program have been designed so that graduate students may acquire a broad basic knowledge in Pharmacology and Neuroscience. Graduate students in the M.S. and Ph.D. in Pharmacology and Neuroscience programs may choose from a diversity of specializations when selecting a research advisor and a research topic. Graduate students in the M.A. in Pharmacology and Neuroscience program are not required to perform laboratory research or write a thesis. Instead, M.A. in Pharmacology and Neuroscience students will complete a capstone project for completion of their degree with the assistance of a faculty advisor, whom they select.

We also offer a cooperative (Co-Op) Ph.D. in Pharmacology and Neuroscience that is a collaboration with the Department of Pharmaceutical Sciences at SIU Edwardsville (SIUE). The Ph.D. degree can follow our Pharmacology and Neuroscience curriculum or can be a specialization in Medicinal Chemistry for those interested in synthetic or computational chemistry. Research advisors for Co-Op PhD students should be chosen from the SIUE Department of Pharmaceutical Sciences.

Admission and Application

The minimum requirement for admission to an advanced degree program in Pharmacology and Neuroscience is an undergraduate degree in one of the biological sciences. While not required, one year of physics, mathematics, and chemistry is recommended. Students may be admitted with a deficiency in this prerequisite, but it must be remedied at an accredited university that is approved by the Graduate School prior to completion of PHRM 550A and PHRM 550B. Students with undergraduate training in related areas, such as chemistry, physics, mathematics, computer science, psychology or engineering are also eligible for admission in Pharmacology and Neuroscience graduate programs.

Unrestricted admission into the M.A. and M.S. in Pharmacology and Neuroscience programs requires an undergraduate grade point average (GPA) of 3.0 (A = 4.0). Unrestricted admission into the Ph.D. in Pharmacology and Neuroscience program requires an undergraduate GPA of 3.25 (A = 4.0). Students entering the Ph.D. in Pharmacology and Neuroscience program may be admitted directly from a master's program without completion of a thesis in a process called Accelerated Entry.

Accelerated Entry (from a master's program) is designed for students who make an early commitment to pursuing a Ph.D. in Pharmacology and Neuroscience degree. The Pharmacology and Neuroscience Graduate Program recommends this option after the student's credentials, eligibility and performance have been reviewed. To be eligible for this option: (1) the student must have attained a 3.25 (A = 4.0) GPA in graduate course work, (2) the student must have successfully completed the core courses with a grade of B or better and (3) a research advisor with whom the student will work toward their dissertation should submit a letter of recommendation attesting to the student's ability and potential to perform doctoral research. Approval of this request must be given by the Graduate Program Committee and the Department Chair. The Chair of the Department will then request from the Graduate School a waiver of the master's degree or master's equivalency before entry into the doctoral program.

Students interested in the Co-Op Ph.D. program with SIUE should contact Department of Pharmaceutical Sciences faculty and identify a dissertation research mentor before applying to the program.

Each applicant must submit an application online at gradschool.siu.edu/apply which contains the following:

1. A non-refundable \$65 application fee. Applicants must pay this fee by credit card.

2. Unofficial transcripts for all undergraduate and graduate coursework
3. Copies of all diplomas.
4. A copy of TOEFL, IELTS, or Duolingo scores (international applicants only).
5. A copy of the Graduate Record Examination (GRE) score.
6. Three letters of recommendation.
7. A Career Statement (limit to 250 words) describing the career path that the applicant intends to pursue upon completion of graduate study.
8. A Statement of Research Interests (limit to 250 words). Identify 2-3 Pharmacology Department or cross-appointed faculty members whose research interests are most aligned with those of the applicant, as well as specific reasons for this selection. The faculty research interests can be found on the Department of Pharmacology Website. Applicants for the M.A. in Pharmacology and Neuroscience program are not required to submit this document.
9. A resume or curriculum vitae.
10. A copy of current passport (International applicants only).
11. A copy of current Visa (International applicants only).
12. Proof of funding for the first year (International applicants applying for the M.A. in Pharmacology and Neuroscience degree only).

In addition, applicants must submit the following directly to the Pharmacology Department:

1. Official transcripts for all undergraduate and graduate coursework sent in a sealed envelope directly from each university or college attended by the applicant.
2. Graduate Record Examination (GRE) scores sent directly from the ETS. (School code 1726; Department code 0216)
3. TOEFL, IELTS, or Duolingo scores (International applicants ONLY) sent directly from ETS. School code (1726; Department code 0216)

Performance Requirements to Maintain Student Status

A cumulative GPA of 3.0 (A = 4.0) in all graduate coursework is required to remain in the M.A., M.S., and Ph.D. in Pharmacology and Neuroscience programs. Any grade below B in a Pharmacology and Neuroscience core course must be remediated by retaking the course and earning at least a B grade.

Financial Assistance

The Pharmacology and Neuroscience Graduate Program offers financial assistance that includes tuition waivers, research assistantships, and fellowships for M.S. and Ph.D. in Pharmacology and Neuroscience students; application for this support is made directly to the Department of Pharmacology. The department does not provide financial support to students in the M.A. in Pharmacology and Neuroscience program. The Graduate School governs limits on support.

M.S. and Ph.D. in Pharmacology and Neuroscience students should be aware that renewal of research assistantship or fellowship support is contingent upon satisfactory performance evaluations. Performance is documented in an annual progress report that is evaluated by the student's advisor and the Graduate Program Committee. The performance evaluation considers both assigned duties relevant to graduate assistantships and progress in coursework and research. Failure to make satisfactory progress towards the degree, as documented in the annual progress report, may lead to termination of support.

Procedures

All M.S. and Ph.D. in Pharmacology and Neuroscience students are required to complete core coursework that is supplemented with appropriate electives. The core courses are [PHRM 501](#), [PHRM 500](#) (Introduction to Seminar, Pharmacology Seminar), [PHRM 550A](#) and [PHRM 550B](#) (Principles of Pharmacology), and [PHRM 577](#) (Neuroscience). [PHRM 530](#) (Advanced Pharmacology and Neuroscience) is an additional core course for Ph.D. in Pharmacology and Neuroscience students. Equivalent course work completed at other institutions or in other collegiate units may be substituted for certain course requirements for graduate course work in Pharmacology and Neuroscience if approved by the Pharmacology and Neuroscience Graduate Program Committee and the Graduate School. The core coursework for the Medicinal Chemistry track of the Co-Op Ph.D. program are [PHRM 501](#), [PHRM 500](#) (Introduction to Seminar, Pharmacology Seminar), as well as PHPS 420 (Principles of Pharmacology),

PHPS 500 (Current Targets for Drug Discovery), PHPS 501 (Principles of Rational Drug Discovery), CHEM 541 (Advanced Organic Chemistry), and CHEM 551 (Advanced Biochemistry), which are taught on the SIUE campus.

In accordance with the graduate school, maximum coursework for full-time graduate students is 16 credit hours per semester; 9 credit hours is considered a normal course load and 8 credit hours is the minimum for fall/spring semesters while 3 credit hours is the minimum for summer semesters. For Ph.D. in Pharmacology and Neuroscience students, after admission into candidacy, 6 credit hours is the minimum. Students in the Co-Op Ph.D. program with SIUE must be registered on both campus for each semester. If not taking a course taught on the SIUE campus, students should register for 0 credit hours of UNIV 500. If not taking a course taught on the SIUC campus, student should register for 0 credit hours of PHRM 601 Section 777.

All graduate students must acquire training in the use of appropriate Research Tool(s) as required by the Graduate School. All students are required to attain competence in [PHRM 540](#) (Responsible Conduct of Research). M.S. in Pharmacology and Neuroscience students are required to complete one additional Research Tool course. Ph.D. in Pharmacology and Neuroscience students are required to complete two additional Research Tool courses. Students may fulfill the requirements for a Research Tool by taking any of the following courses: [PHRM 552](#) (Applied Statistics for the Basic Sciences), [MBMB 504](#) (Research Methods), or [PHRM 551](#) (Methods in Pharmacology), or for Co-Op Ph.D. students CHEM 531 (Advanced Analytical Chemistry) and CHEM 561 (Advanced Physical Chemistry). Students may also complete the Research Tool requirement by taking a different course that is approved by the Pharmacology and Neuroscience Graduate Program Committee, or by formal training, or by demonstrating competence in another manner acceptable to the Pharmacology and Neuroscience Graduate Program Committee.

An advisory system in Pharmacology and Neuroscience will help students in planning their coursework. Upon their admission to the M.S. or Ph.D. in Pharmacology and Neuroscience program, the Graduate Program Director will advise students until the student chooses a research advisor. The program outlined by students, their advisors and their thesis/dissertation committees are subject to approval by the Pharmacology and Neuroscience Graduate Program Committee. The choice of advisor and the formulation of the thesis/dissertation committee is an important step and should be carefully considered. Students should choose a research advisor after completion of core coursework (including the required Research Tool courses which may include [PHRM 551](#)) and passage of the preliminary examination

As soon as a graduate student has selected a research advisor and developed a thesis/dissertation project, a thesis/dissertation committee should be formed. The thesis committee for a student in the M.S. in Pharmacology and Neuroscience program must have a minimum of four members: the student's research advisor (chair), two faculty members from the Department of Pharmacology and one faculty member from an outside department or from another institution. The dissertation committee for a student in the Ph.D. in Pharmacology and Neuroscience program must have a minimum of five members: the student's research advisor (chair), two or three faculty members from the Department of Pharmacology, and one or two faculty members from outside the department or from another institution. The dissertation committee for students in the Co-Op Ph.D. program with SIUE must have two faculty members from SIUE's Department of Pharmaceutical Sciences, two faculty members from SIUSOM's Department of Pharmacology, and one faculty member from outside these departments or from another institution. Members of these committees should be able to contribute significantly in the area of the student's research program. If the research advisor does not have a primary academic appointment in the Department of Pharmacology (except for the Co-Op Ph.D. program), then a co-mentor from the Department of Pharmacology is required and that co-mentor serves as the committee chair. The Chair of the Department of Pharmacology and the Graduate Program Director are ex-officio members for all thesis/dissertation committees of which they are not formal members. The student will submit the names of committee members to the Graduate Program Committee to ensure appropriate membership is included and will request approval of this committee from the Graduate School.

Master of Arts (M.A.) in Pharmacology and Neuroscience

Requirements

The M.A. in Pharmacology and Neuroscience is designed for the completion of all coursework online, with the exception [PHRM 551](#) Methods in Pharmacology, although students have the option of in-person attendance. A total of 34 credit hours at the 400- and 500-level is required for the M.A. in

Pharmacology and Neuroscience degree. Of the total credit hours completed, at least 20 of these must be graded (A, B, C) hours. At least 17 of the total 34 credit hours must be 500-level courses. Of these 17 credit hours, a minimum of six credit hours of [PHRM 590](#) (Readings or Research in Pharmacology) is required. More than 6 credit hours of [PHRM 590](#) may be taken, however only six may be counted toward the 500-level requirement. The faculty advisor will help plan course work. Students are not required to perform laboratory research or write a thesis for the M. A. in Pharmacology and Neuroscience degree. Students must pass a comprehensive exit examination upon completion of the coursework and complete a capstone project that is literature based and under the direction of a faculty mentor, whom the student chooses. Credit for the capstone project occurs through [PHRM 590](#) Readings or Research in Pharmacology.

Sample Curriculum Map

Fall Semester - 14 Credit Hours

- PHRM 550A: Principles of Pharmacology (4 CH)
- PHRM 577: Neuroscience (4 CH)
- PHRM 501: Introduction to Seminar (1 CH)
- PHRM 540: Responsible Conduct in Research (1 CH)
- PHRM 590: Readings or Research in Pharmacology (4 CH)

Spring Semester - 14 Credit Hours

- PHRM 550B: Principles of Pharmacology (4 CH)
- PHRM 512: Regulatory Issues in Drug Development (2 CH)
- PHRM 501: Introduction to Seminar (1 CH)
- PHRM 530: Advanced Pharm. and Neurosci. (3 CH)
- PHRM 590: Readings or Research in Pharmacology (4 CH)

Summer Semester - 6 Credit Hours

- PHRM 551: Methods in Pharmacology (4 CH)
- PHRM 590: Readings or Research in Pharmacology (2 CH)

Master of Science (M.S.) in Pharmacology and Neuroscience

Requirements

1. A minimum of two-years of full-time study (one year in residence).
2. A total of 30 credit hours at the 400 and 500 level. At least 15 of these credit hours must be in 500-level courses, of which a maximum of six credit hours should be [PHRM 599](#) (Thesis Research) can be counted.
3. Completion of core coursework with a grade of B or better in each course, completion of [PHRM 540](#) (Responsible Conduct of Research) and completion of at least one Research Tool course.
4. A written comprehensive examination must be passed with at least a grade of B. It will be prepared, conducted and evaluated by the faculty in the Department of Pharmacology with leadership by the Graduate Program Director. Students will take this exam upon completion of the major core course work.
5. Before significant research has begun, a thesis plan is required. The thesis plan will be presented and discussed in an informal meeting with thesis committee members. The thesis plan must be approved by the student's thesis committee and placed in the student's file.
6. Each student is required to have at least six credit hours of [PHRM 599](#) (Thesis Research) before their defense.
7. A thesis must be completed in the student's research area of interest and receive approval from the student's thesis committee. The thesis is expected to be a competent, original research project carried out in a selected area under the research advisor's supervision. It should include a statement of the problem, an adequate review of literature, a careful analysis of results by

appropriate methods and an interpretation of the findings. A preliminary draft of the thesis should be reviewed and approved by the research advisor and a corrected copy should be submitted to other committee members no later than four weeks before the thesis defense.

8. Results of the thesis research must be defended in a seminar that must be announced publicly in advance. Students should submit their thesis abstract to the Graduate Program Director at least two weeks prior to the thesis defense to facilitate the public announcement. Immediately following the seminar, an oral examination will be conducted by the student's thesis committee. Any member of the University community may attend the seminar and participate in questioning and discussion, subject to reasonable time limitations imposed by the committee chair. Only committee members may participate in the oral examination that occurs after the seminar and may vote or make recommendations concerning acceptance of the thesis and the oral examination.
9. The student will be recommended for the M.S. degree if members of the student's thesis committee judge both the thesis and the performance at the oral examination to be satisfactory. A thesis approval form will be completed, signed by the committee and the chair of the Department of Pharmacology, and transmitted to the Graduate School. If performance at the oral examination is unsatisfactory, it may be repeated once, no sooner than three months after the first examination. A second failure will result in dismissal from the Pharmacology and Neuroscience Graduate Program. If the written thesis is unsatisfactory, the student will be allowed to revise the document and send to either the research advisor only or the whole thesis committee for review.
10. Students who have defended their thesis but who missed the Graduate School deadline for final paper/thesis/dissertation submission to graduate in the same semester may register in [PHRM 601](#) (Continuing Enrollment) until completion of the revised thesis document. Students must be registered during the semester in which they graduate. Registering in PHRM 601 can negatively impact visa status thus international students should discuss this issue with the Graduate Program Director.
11. The student is responsible for electronically submitting the thesis to the Graduate School, the Graduate Program Director, and their research advisor. The Department of Pharmacology will have 3 bound copies of the thesis made: for the student, the graduate program curriculum office, and the student's research advisor.
12. Below is a representative schedule for completion of the requirements for the M.S. Degree in Pharmacology and Neuroscience. Students are strongly encouraged to begin research as soon as possible by taking PHRM 590 (Readings or Research in Pharmacology). In addition to the core courses, students should take one graded elective course.

Sample Curriculum Map

First Year, Fall Semester - 13 Credit Hours

- PHRM 550A: Principles of Pharmacology (4 CH)
- PHRM 577: Neuroscience (4 CH)
- PHRM 501: Introduction to Seminar (1 CH)
- MBMB 504: Research Methods (3 CH)
- [PHRM 540](#): Responsible Conduct of Research (1 CH)

First Year, Spring Semester - 10 Credit Hours

- PHRM 550B: Principles of Pharmacology (4 CH)
- PHRM 590: Readings or Research in Pharmacology (2 CH)
- PHRM 501: Introduction to Seminar (1 CH)
- MBMB 530: Advanced Cellular Biology (3 CH)

First Year, Summer Semester - 4 Credit Hours

- PHRM 551: Methods in Pharmacology (4 CH)
- Choose Advisor and form thesis committee
- Preliminary Examination - Written Comprehensive Exam

Second Year, Fall Semester - 11 Credit Hours

- PHRM 501: Introduction to Seminar (1 CH)
- [PHRM 552](#): Applied Statistics for the Basic Sciences (3 CH)
- PHRM 590: Readings or Research in Pharmacology (4 CH)
- PHRM 599: Thesis Research (3 CH)

Second Year, Spring Semester - 10 Credit Hours

- PHRM 501: Introduction to Seminar (1 CH)
- PHRM 590: Readings or Research in Pharmacology (6 CH)
- PHRM 599: Thesis Research - Thesis Defense (3 CH)

Elective Courses

- PHRM 590: Readings or Research in Pharmacology (1-24 CH)
- MBMB 530: Advanced Cellular Biology (Spring) (3 CH)
- PHRM 560: Geriatric Pharmacology (3 CH)
- PHRM 565: Principles of Toxicology (3 CH)
- PHRM 577: Neuropharmacology (3 CH)
- MBMB 555: Cardiovascular Pharmacology (3 CH)
- MBMB 560: Molecular Oncology (3 CH)
- Or other 500-level courses (3 CH)

Research Tools

- PHRM 552: Applied Statistics for the Basic Sciences (3 CH)
- MBMB 504: Research Methods (Fall) (3 CH)
- PHRM 551: Methods in Pharmacology (4 CH)
- PHRM 540: Responsible Conduct of Research (1 CH)

Summary of Requirements for Master of Science in Pharmacology and Neuroscience Degree

1. Achievement of a grade point average of at least a 3.0 (A = 4.0).
2. Achievement of B or better in each of the core courses, including 4 semesters of PHRM 501.
3. Completion of PHRM 540 Responsible Conduct of Research.
4. Completion of one additional Research Tool course.
5. Completion of the comprehensive written exam with a grade of B or better.
6. Informal thesis plan presented to thesis committee and interim meeting(s) with thesis committee to review progress.
7. Submission of thesis to research advisor (10 weeks prior to the defense). Corrected thesis to thesis committee (four weeks prior to the defense).
8. Submission of thesis abstract (two weeks prior to the defense).
9. Oral presentation of the thesis research and successful defense of thesis.
10. Submission of approved thesis as an electronic file to the Graduate School, Graduate Program Director, and research advisor by the deadline posted in the university calendar.
11. Submission of the department clearance form.

Doctor of Philosophy (Ph.D.) in Pharmacology and Neuroscience

Requirements

1. Completion of core coursework with a grade of B or better in each course, completion of [PHRM 540](#) (Responsible Conduct of Research) and completion of at least two Research Tool courses.

2. Completion of a comprehensive written preliminary examination with a grade of B or better. Students who do not pass the preliminary examination will be allowed to repeat it one time, no sooner than three months after the initial examination.
3. The residency requirement for the Ph.D. in Pharmacology and Neuroscience degree must be fulfilled after admission to the doctoral program and before formal admission to doctoral candidacy. The residency requirement is satisfied by completion of 24 hours of graduate credit on campus as a Ph.D. in Pharmacology and Neuroscience student within a period not to exceed 4 calendar years. A Ph.D. in Pharmacology and Neuroscience student will not be permitted to count more than 6 credit hours of [PHRM 600](#) (Dissertation Research) towards the 24 credit hour residency requirement. To meet the residency requirement, students may enroll in any other course(s) in addition to the core courses and Research Tool courses that meets with the approval of their advisor and dissertation committee, e.g. any formal departmental or non-departmental courses and/or [PHRM 590](#) (Readings or Research in Pharmacology).
4. Admission to candidacy. The student is admitted to Ph.D. in Pharmacology and Neuroscience candidacy after having completed the residency requirement, the Research Tool requirement and passing the comprehensive written preliminary examination. Admission to candidacy is granted by the Dean of the Graduate School upon recommendation of the student's dissertation committee or the Graduate Program Committee. The Ph.D. in Pharmacology and Neuroscience degree may not be conferred fewer than six months nor more than five years after admission to candidacy, except upon approval of the Dean of the Graduate School.
5. Students must complete at least 24 credit hours of [PHRM 600](#) (Dissertation Research) to complete the dissertation research project and prepare the dissertation document to meet the requirements of the dissertation committee and the Graduate School. Students in the Co-Op Ph.D. program must have at least 12 credit hours of dissertation research from each campus. Students who have defended their dissertation but who missed the Graduate School deadline for final paper/thesis/dissertation submission to graduate in the same semester may register in [PHRM 601](#) (Continuing Enrollment) until completion of the revised dissertation document. Students must be registered during the semester in which they graduate. Registering in PHRM 601 can negatively impact visa status thus international students should discuss this issue with the Graduate Program Director.
6. A dissertation proposal is required before the student begins significant research. The dissertation proposal should be written in the style of a NIH F31 grant with some modifications. An oral proposal will be presented as a seminar to the Department of Pharmacology. Immediately following this seminar, the proposal will be defended before the student's dissertation committee. Students must pass both the oral and written portions of the dissertation proposal as determined and documented by their dissertation committee.
7. The student must meet formally with the dissertation committee at least once between defense of the proposal and the dissertation defense. The purpose of this interim meeting is to review progress and to modify the planned experiments, if deemed necessary. While not required, annual meetings with the dissertation committee is recommended.
8. The dissertation defense and seminar will occur no earlier than one year after the dissertation proposal defense and after at least one primary research paper with the student as first author has been submitted for publication to a peer-reviewed journal. The dissertation is expected to be a competent, original research project that will make significant contribution to the body of scientific knowledge. It should include a statement of the problem, an adequate review of literature, a careful analysis of results by whatever methods are appropriate, and an interpretation of the findings.
9. A preliminary draft of the dissertation should be reviewed and approved by the research advisor and a corrected copy should be submitted to other committee members no later than four weeks before the dissertation defense.
10. Results of the dissertation research must be defended in a seminar which must be announced publicly in advance. Students should submit their dissertation abstract to the Graduate Program Director at least two weeks in advance of the dissertation defense to facilitate the public announcement. Any member of the University community may attend the dissertation seminar and may participate in the questioning and discussion, subject to reasonable time limitations imposed by the committee chair. Immediately following the dissertation seminar, a final oral examination will be conducted by the student's dissertation committee. Only members of the committee may participate in the oral examination that occurs after the seminar and may vote or make recommendations concerning acceptance of the dissertation and final examination. A student will be recommended for the degree if members of the dissertation committee judge both the dissertation seminar and the performance at the final oral examination to be satisfactory. If approved, a dissertation approval form will be completed, signed by the committee and the Chair of the Department of Pharmacology,

and submitted to the Graduate School. In the case of failure of the oral examination, it may be repeated once, no sooner than three months after the first examination. Failure of the second examination will result in dismissal from the Pharmacology and Neuroscience Graduate Program. If the written dissertation is unsatisfactory, the student will be allowed to revise the document and send to either the research advisor only or the whole dissertation committee for review and approval.

11. The student is responsible for electronically submitting the dissertation to the Graduate School, the Graduate Program Director, and their research advisor. The Department of Pharmacology will have 3 bound copies of the thesis made: for the student, the graduate program curriculum office, and the student's research advisor.

Below is a representative schedule for the Ph.D. in Pharmacology and Neuroscience degree. Note that alternative scheduling is available for those students who already have a M.S. degree in Pharmacology and Neuroscience or who are participating in the Co-Op Ph.D. program with a Medicinal Chemistry focus. Students are also strongly encouraged to start research as soon as possible by taking [PHRM 590](#) (Readings or Research in Pharmacology).

Sample Curriculum Map

First Year, Fall Semester - 13 Credit Hours

- PHRM 550A: Principles of Pharmacology (4 CH)
- PHRM 577: Neuroscience (4 CH)
- PHRM 501: Introduction to Seminar (1 CH)
- MBMB 504: Research Methods (3 CH)
- [PHRM 540](#): Responsible Conduct of Research (1 CH)

First Year, Spring Semester - 12 Credit Hours

- PHRM 550B: Principles of Pharmacology (4 CH)
- PHRM 530: Advanced Pharmacology and Neuroscience (3 CH)
- PHRM 590: Readings or Research in Pharmacology (1 CH)
- PHRM 501: Introduction to Seminar (1 CH)
- MBMB 530: Advanced Cellular Biology (3 CH)
- Completion of residency requirements for Ph.D. in Pharmacology and Neuroscience

First Year, Summer Semester - 4 Credit Hours

- PHRM 551: Methods in Pharmacology (4 CH)
- Choose Advisor and form dissertation committee
- Preliminary Examination
- Admission to Candidacy when eligible

Second Year, Fall Semester - 7 Credit Hours

- PHRM 501: Introduction to Seminar (1 CH)
- PHRM 552: Applied Statistics for the Basic Sciences (3 CH)
- PHRM 600: Dissertation Research (3)

Second Year, Spring Semester - 6 Credit Hours

- PHRM 501: Introduction to Seminar (1 CH)
- PHRM 600: Dissertation Research (5 CH)

Second Year, Summer Semester - 3 Credit Hours

- PHRM 600: Dissertation Research (3 CH)

After Second Year, Fall Semester - 6 Credit Hours

- PHRM 600: Dissertation Research (5 CH)
- PHRM 500: Pharmacology Seminar (1 CH)

After Second Year, Spring Semester - 6 Credit Hours

- PHRM 600: Dissertation Research (5 CH)
- PHRM 500: Pharmacology Seminar (1 CH)

After Second Year, Summer Semester - 3 Credit Hours

- PHRM 600: Dissertation Research (3 CH)

Elective Courses

- PHRM 590: Readings or Research in Pharmacology (1-24 CH)
- MBMB 504: Research Methods (Fall) (3 CH)
- MBMB 530: Advanced Cellular Biology (Spring) (3 CH)
- PHRM 574: Neuropharmacology (3 CH)
- PHRM 555: Cardiovascular Pharmacology (3 CH)
- PHRM 560: Geriatric Pharmacology (3 CH)
- PHRM 565: Principles of Toxicology (3 CH)
- MBMB 560: Molecular Oncology (3 CH)
- Or other 500-level courses (3 CH)

Research Tools

- PHRM 552: Applied Statistics for the Basic Sciences (3 CH)
- MBMB 504: Research Methods (Fall) (3 CH)
- PHRM 551: Methods in Pharmacology (4 CH)
- PHRM 540: Responsible Conduct of Research (1 CH)

Summary of Requirements for Doctor of Philosophy in Pharmacology and Neuroscience Degree

1. Achievement of a grade point average of at least 3.00 (A = 4.0)
2. Completion of the core coursework with a grade of B or better, including 4 semesters of PHRM 501.
3. 24 credit hours of graduate course work for residency.
4. Completion of [PHRM 540](#) (Responsible Conduct of Research) and 2 additional Research Tool courses.
5. Completion of the comprehensive written preliminary exam of course work with a grade of B or better.
6. Admission to candidacy.
7. Successful oral defense of dissertation proposal and approval of the written dissertation proposal by the student's dissertation committee.
8. Completion of 24 hours of dissertation credit (PHRM 600).
9. At least one meeting with dissertation committee after completion of the dissertation proposal and before the dissertation defense.
10. Submission of at least one primary research manuscript, based on the student's dissertation research, for publication to a peer-reviewed journal with the student as first author.
11. Submission of dissertation to student's research advisor with copies of publications or submitted manuscripts (10 weeks prior to defense).
12. Corrected dissertation submitted to the dissertation committee (four weeks prior to defense).
13. Submission of dissertation abstract (two weeks prior to the defense) for the public announcement of dissertation defense.
14. Successful oral defense of dissertation and approval of the written dissertation by the student's dissertation committee.

15. Submission of approved dissertation as an electronic file to Graduate School, graduate program office, and research advisor.
16. Submission of departmental clearance form.

Pharmacology and Neuroscience Courses

PHRM500 - Pharmacology Seminar Presentation of research and current literature in pharmacology. Required of all graduate students in pharmacology after completion of four credit hours of 501. Requires presentation at a Journal Club session each fall semester and a formal seminar each spring semester for duration of registration. Graded S/U only. Prerequisite: PHRM 501. (Springfield Only.) Credit Hours: 1-16

PHRM501 - Introduction to Seminar Training in interpretation of research and current literature in order to enhance quality of seminar presentation. Enrollment for the initial four semesters is required of all beginning pharmacology graduate students. All other pharmacology graduate students must enroll in PHRM 500. (Springfield Only.) Credit Hours: 1-4

PHRM512 - Regulatory Issues in Drug Development This course provides content covering the drug development process and FDA regulatory requirements for over-the-counter and prescription drugs and biologics. It provides an overview of the drug development phases, the pharmaceutical industry, and the regulatory concepts that shape federal oversight and industry decisions. No prerequisites are required. Credit Hours: 2

PHRM530 - Advanced Pharmacology & Neuroscience The goal of this course is to understand the process involved in scientific discovery and research by reading, analyzing, criticizing and discussing scientific articles covering the field of Pharmacology and Neuroscience and the related field of cellular and molecular biology. Prerequisites: PHRM 550A Principles of Pharmacology and PHRM 577 Neuroscience. (Springfield Only). Credit Hours: 3

PHRM540 - Responsible Conduct of Research This course will provide information on topics relevant to the ethical conduct of research, including conflict of interest, publication policies, animal and human subjects, peer review, and mentoring. No prerequisite. Credit Hours: 1

PHRM542 - Regulatory Issues in Drug Development This course will examine regulatory issues, including clinical trials, the FDA process for drug approval, technology transfer and intellectual property. No prerequisites. Credit Hours: 2

PHRM550A - Principles of Pharmacology A study of chemistry, pharmacodynamic actions, mechanisms of action, absorption, distribution, metabolism, elimination, adverse effects, interactions and toxic effects of drugs currently used in therapeutics. Three to five hours lecture, one to four hours discussion per week. Must be taken in sequence. No prerequisite required. Credit Hours: 4

PHRM550B - Principles of Pharmacology A study of chemistry, pharmacodynamic actions, mechanisms of action, absorption, distribution, metabolism, elimination, adverse effects, interactions and toxic effects of drugs currently used in therapeutics. Three to five hours lecture, one to four hours discussion per week. Must be taken in sequence. No prerequisite required. Credit Hours: 4

PHRM551 - Methods in Pharmacology The main objective is to acquaint the student with various sophisticated laboratory equipment, basic techniques/principles of pharmacological experiments. One hour lecture and three hours laboratory twice weekly. This course is prerequisite to all advanced pharmacology courses. (Springfield Only.) Credit Hours: 4

PHRM552 - Applied Statistics for the Basic Sciences This course reviews introductory statistics and focuses on advanced statistics, linear and nonlinear modeling, applicable to basic biomedical sciences. The course will also provide students with experience in the use of statistical package computer programs for data analysis. No prerequisite required. Credit Hours: 3

PHRM555 - Cardiovascular Pharmacology A study of structure, biochemistry, electrophysiology, and neurogenic and humoral regulation of the cardiovascular system in normal and diseased states. Three

hours of lecture per week. Prerequisite: PHRM 550A,B or equivalent, or consent of course coordinator. (Springfield Only.) Credit Hours: 3

PHRM560 - Geriatric Pharmacology A study covering age-related changes in the physiology of particular organ systems which lead to the prevalence of many diseases and to altered drug action in the elderly. Research issues in aging will be discussed emphasizing the biological substrates of altered pharmacodynamics and pharmacokinetics in the aged. Prerequisite: PHRM 550A,B. Special approval needed from the course coordinator. (Springfield Only.) Credit Hours: 3

PHRM565 - Principles of Toxicology This course deals with principles and understanding of phenomena of chemical-biologic interactions; a study of adverse chemical effects on living organisms and risk that chemical exposure poses to man/environment; deleterious, acute, chronic chemical effects on specific organs, tests to predict risks, facilitate search for safer chemicals and drugs and means of rational treatment of manifestations of toxicity; prominent discussion on drugs, medical devices, food additives, pesticides; regulation of toxic chemicals, hazardous wastes, toxic pollutants in water and air; and emphasis on diseases caused by and uniquely associated with drugs, diagnosis and treatments of such intoxicants. (Springfield Only.) Credit Hours: 3

PHRM574 - Neuropharmacology (Same as PHSI 574) A detailed examination of the biochemical aspects of neuropharmacology with emphasis on neurotransmitters; their synthesis, storage, release and metabolism in the central and peripheral nervous system. Considerable emphasis is placed on major research developments (both past and present) that influence how one studies the action of drugs on the nervous system. Prerequisite: PHSI 410A/B and CHEM 451A/B. Credit Hours: 3

PHRM577 - Neuroscience This course provides basic neuroscience knowledge covering the fundamental principles of neural cell biology, neurophysiology, neurochemistry, neuroanatomy and behavior. This knowledge is essential to understand the mode of action of the drugs acting on excitable cells including muscle, autonomic system and central nervous system. No prerequisite. Credit Hours: 4

PHRM590 - Readings or Research in Pharmacology Special arrangements to be made with the instructor with whom the student wishes to work. Graded S/U only. Credit Hours: 1-24

PHRM599 - Thesis Research Research for thesis for a Master's degree. Hours and credit to be arranged by chair and adviser. Credit Hours: 1-6

PHRM600 - Dissertation Research Research for dissertation for the Ph.D. degree. Hours and credit to be arranged by chair and adviser. Credit Hours: 1-32

PHRM601 - Continuing Enrollment For those graduate students who have not finished their degree programs and who are in the process of working on their dissertation, thesis or research paper. The student must have completed a minimum of 24 hours of dissertation research, or the minimum thesis, or research hours before being eligible to register for this course. Concurrent enrollment in any other course is not permitted. Graded S/U or DEF only. Credit Hours: 1

PHRM699 - Postdoctoral Research Must be a Postdoctoral Fellow. Concurrent enrollment in any other course is not permitted. Credit Hours: 1

Pharmacology and Neuroscience Faculty

Arai, Amy C., Professor, Ph.D., (Springfield), Chiba University, 1987; 1999. Molecular and pharmacological modulation of AMPA-type glutamate receptors and its impact on synaptic physiology.

Caspary, Donald M., Distinguished Research Professor, Ph.D., (Springfield), New York University, 1971; 1973. Sensory physiology, neurophysiology, age-related hearing loss, tinnitus.

Copello, Julio A., Associate Professor, Ph.D., (Springfield), National University of La Plata, 1989; 2005. Molecular mechanism of intracellular calcium signaling and its role in ischemia and breast cancer.

Cox, Brandon, Associate Professor and Director of Graduate Program, Ph.D., (Springfield), Georgetown University, 2008; 2013. Hair cell regeneration in the cochlea and vestibular organs; postnatal maturation of the cochlea, and mechanisms of hair cell survival.

- Crider, Michael**, Professor, Ph.D., (Edwardsville), University of Kentucky, 1975; 2004. Synthetic medicinal chemistry, somatostatin non-peptides, sigma 2 ligands.
- Elble, Randolph C.**, Associate Professor, Ph.D., (Springfield), Indiana University, 1986; 2005. Tumor suppression in breast cancer by CLCA family of chloride current regulators.
- Faingold, Carl L.**, Distinguished Professor, Ph.D., (Springfield), Northwestern University, 1970; 1972. Convulsive seizure mechanisms and effects of anticonvulsants; pharmacological alterations of cerebral evoked potentials, sudden unexpected death in epilepsy (SUDEP).
- Hascup, Erin R.**, Associate Professor, Ph.D., (Springfield), University of Kentucky, 2007; 2013. Neurological, neurochemical, and cognitive changes in aging, Alzheimer's disease, and related disorders; stage-specific therapeutics, early diagnosis and treatment in Alzheimer's disease.
- Hascup, Kevin**, Assistant Professor, Ph.D., (Springfield), University of Kentucky, 2007; 2018. Metabolic and glutamatergic dysregulation during Alzheimer's disease progression and successful aging; identification of disease-modifying life-style factors and biomarker-targeted therapeutics.
- Kolling, William M.**, Associate Professor, Ph.D., (Edwardsville), University of Iowa, 1997; 2005. Pharmaceuticals, design and synthesis of antibiotic nanoparticles, oral formulations for poorly soluble agents.
- Kontoyianni, Maria**, Professor, Ph.D., (Edwardsville), University of North Carolina-Chapel Hill, 1992; 2009. Computer-aided drug discovery, virtual screening, chemogenomics, and machine learning, comparative modeling. Disease-related targets: Somatostatin and chemokines (GPCRs), cytochrome P450s, TLR4, and Chlamydia trachomatis phosphatase CppA.
- Kwon, Guim**, Professor, Ph.D., (Edwardsville), Southern Illinois University, 1992; 2005. Glucose and insulin homeostasis, artificial pancreas system.
- McPherson, Timothy**, Professor, Ph.D., (Edwardsville), Purdue University, 1995; 2005. Drug delivery and drug product stability.
- Nieto, Marcelo**, Professor, Ph.D., (Edwardsville), Universidad Nacional de Cordoba (Cordoba, Argentina), 2000; 2006. Drug design and synthesis of rational focused libraries for diverse therapeutic areas (antimicrobial, anticancer, pain, etc.).
- Premkumar, Louis S.**, Professor, Ph.D., (Springfield), Australian National University, 1992; 1999. Molecular mechanism(s) underlying pain perception; structure, function of ion channels, treatment options for chronic pain associated with peripheral neuropathies.
- Ramkumar, Vickram**, Professor, Ph.D., (Springfield), University of Maryland, 1986; 1992. Mechanism(s) underlying drug- and noise-induced hearing loss, development of therapeutics in reducing or preventing hearing loss.
- Richardson, Ben**, Assistant Professor, Ph.D., (Springfield), Southern Illinois University, 2012; 2020. Sensorimotor circuit anatomy, function, and plasticity in neurological disease/disorders (Autism, alcoholism, and aging).
- Rybak, Leonard P.**, Professor, M.D., Ph.D., (Springfield), University of Minnesota, 1973; 1981. Mechanism(s) underlying drug- and noise-induced hearing loss, development of therapeutics in reducing or preventing hearing loss.
- Santanello, Catherine**, Professor, Ph.D., (Edwardsville), St. Louis University, 1990; 1992. Microbial pathogens in water resources, arachnid vectors.
- Schober, Joseph**, Professor, Ph.D., (Edwardsville), University of Illinois Chicago, 2003; 2007. Cell motility, cell cytoskeleton, cancer cell biology and cell-hydrogel interaction.
- Tischkau, Shelley A.**, Professor and Chair, Ph.D., (Springfield), University of Illinois at Urbana-Champaign, 1995; 2007. Molecular and neurological bases of whole animal physiological processes, circadian rhythmicity, metabolism, and environmental toxicology.
- Witt, Ken**, Professor, Ph.D., (Edwardsville), University of Arizona, College of Medicine 2001; 2005. CNS drug delivery, blood-brain barrier, somatostatin brain effects in aging and disease, develop therapeutics to treat Alzheimer's disease progression.
- Worthington, Ronald E.**, Professor, Ph.D., (Edwardsville), Washington University in St. Louis School of Medicine, 1982; 2005. Human genomic disease gene discovery and somatic genetics of breast cancer.