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**Drexel University College of Medicine**  
***Pharmacology & Physiology MS Program***

**POLICIES AND PROCEDURES**

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**PROGRAM OF STUDY FOR M.S. DEGREE IN PHARMACOLOGY & PHYSIOLOGY**

**A. Course Requirements**

The curriculum includes one semester of a “Core Curriculum” that is shared by all of the biomedical graduate programs and a series of programmatic courses specific for Pharmacology and Physiology students. In the 1<sup>st</sup> year, all students in the Pharmacology and Physiology Program must take Core Curriculum, Responsible Conduct of Research, and Biostatistics OR Statistics for Neuro/Pharm Research (except students who may have had comparable courses elsewhere). All students in the Pharmacology and Physiology Program are required to take the following programmatic courses in the first year: Graduate Physiology, Graduate Pharmacology, and Advanced Topics in Pharmacology. In the second year, students must take Principles of Neuropharmacology. Students are required to take 2 graduate level elective courses chosen with advice from the Program Director and/or the Research Advisor. All students must register and participate in the seminar/discussion course Current Topics in Pharmacology and Physiology every semester while in the program up until registering for Thesis Defense. It is expected that each student in the MS program will choose a laboratory for thesis work by June of his/her first year, and thesis research will begin in the summer between first and second year. The Pharmacology and Physiology Program Director will advise each student on the selection of the flexible aspects of the curriculum. The requirement for the MS is similar to the doctoral program except that the research project need not be as extensive, and hence the total number of research credits typically will be fewer. There is no teaching requirement or preliminary exam for M.S. students.

**B. Curriculum**

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**First Year Fall Semester**

|  |                   |           |
|--|-------------------|-----------|
| Core Concepts in Biochemistry and Cell Biology         | 4 credits         | IDPT 533S |
| Learn Early As Professionals I (LEAP I)                | 1 credit          | IDPT 502S |
| Graduate Physiology                                    | 4 credits         | PHGY-503S |
| Pharmacology & Physiology 1 <sup>st</sup> Lab Rotation | 4 credits         | PHRM-503S |
| Current Topics in Pharmacology & Physiology            | 1 credit          | PHRM-502S |
| <b>Total credits:</b>                                  | <b>14 credits</b> |           |

**First Year Spring Semester**

|  |                   |           |
|--|-------------------|-----------|
| Responsible Conduct of Research                        | 2 credits         | IDPT-500S |
| Learn Early and Practice (LEAP II)                     | 1 credit          | IDPT 504S |
| Graduate Pharmacology                                  | 3 credits         | PHRM-512S |
| Advanced Topics in Pharmacology                        | 1 credit          | PHRM-517S |
| Pharmacology & Physiology 2 <sup>nd</sup> Lab Rotation | 4 credits         | PHRM-504S |
| Current Topics in Pharmacology & Physiology            | 1 credit          | PHRM-502S |
| <b>Total credits:</b>                                  | <b>12 credits</b> |           |

**Second Year Fall Semester**

|   |                      |           |
|---|----------------------|-----------|
| Principles of Neuropharmacology             | 3 credits            | PHRM-507S |
| Current Topics in Pharmacology & Physiology | 1 credit             | PHRM-502S |
| Pharmacology & Physiology Thesis Research   | 9 credits            | PHRM-600S |
| Biostatistics*                              | 2 credits            | IDPT-501S |
| Electives                                   | 1-3 credit(s)        |           |
| <b>Total credits:</b>                       | <b>16-18 credits</b> |           |

**Second Year Spring Semester**

|   |                      |           |
|---|----------------------|-----------|
| Pharmacology & Physiology Thesis Research   | 9 credits            | PHRM-600S |
| Current Topics in Pharmacology & Physiology | 1 credit             | PHRM-502S |
| Electives                                   | 1-3 credit(s)        |           |
| <b>Total credits:</b>                       | <b>11-13 credits</b> |           |

\*Statistics requirement may be satisfied by taking either Biostatistics (IDPT-501S) OR Statistics for Neuro/Pharm Research (NEUR-500S).

The Pharmacology & Physiology Program Director will serve as Advisor to New Graduate Students and meet with each graduate student once during the Fall and Spring semesters of the first year of study.

Failed courses must be repeated. Regarding the Programmatic courses, a grade of B must be earned in each course. Programmatic courses in which a student has earned a grade below B can be remediated to a B.

**Unsatisfactory Performance in Current Topics in Pharmacology & Physiology**

Two unexcused absences are allowed per year for journal clubs. More than two absences will result in a grade of Unsatisfactory (U). The “U” must be remediated to the satisfaction of the course director.

**Laboratory Rotations**

***The two MS lab rotations should be arranged during the first year*** in consultation with the Program Director and faculty of the Pharmacology & Physiology Program. The research areas may be chosen to complement the student's long-term research interests. Research rotations should provide an opportunity to:

- Practice scientific logic and experimental design
- Acquire useful technical expertise
- Extend scientific and personal interactions within and between labs
- Explore the possibility for a future Thesis research topic
- Develop presentation skills

***At least 20 hours per week (minimum) for a three-month period are required for each rotation.*** The first rotation must begin no later than mid-August of the first year, and students must satisfactorily complete all rotations no later than Fall semester of second year. An oral presentation

of the research experience is prepared by the student at the end of each rotation, presented to the department and evaluated by the faculty and the student.

Students and their mentors must complete a rotation evaluation form at the beginning, middle and upon completion of their rotation. A confidential evaluation of the PI from the student to the Program director is optional. Forms are available on the student portfolio website, as well as example forms. Upon completion of the final rotation, a student must immediately choose and enter a research lab to start Thesis research.

Students in good academic standing (GPA 3.0 and above), who have extensive previous academic lab research experience (1-year minimum, full time), have already identified/selected a specific Thesis laboratory for their Thesis work, and/or have a Master of Science in a field related to biomedical research may petition the Program Director to opt out of the second rotation. The students must provide a letter from their chosen Thesis Advisor to verify that the student has been accepted in that lab for Thesis work. The Program Director will forward the student's request to the Pharmacology & Physiology Steering Committee for consideration. If approved, students must immediately start their Thesis research.

### **Unsatisfactory Performance in Laboratory Rotations**

Laboratory rotations are graded on a Satisfactory (S) or Unsatisfactory (U) basis. Students receiving an "S" are rated on a performance scale ranging from Outstanding (1) to Poor (5). A "U" for a lab rotation is reserved for students that do not meet performance requirements, including attendance, of the rotation as stipulated by the program. Please refer to the Laboratory rotations syllabus for more information.

### **Advanced Elective Courses**

In consultation with the Advisory Committee or a student's mentor and according to the area of selected research, the student is required to select and pass a minimum of 2 advanced elective courses from a diverse range of topics that complement the core curriculum and provide relevant, in-depth knowledge. The 2 elective courses can be taken as appropriate throughout the student's training. A list of potential electives is provided below. This is a representative list, you are not limited to selecting from this list of electives. It is recommended that you consult with the course director for each course to receive approval to register for the course and to discern if there are prerequisites or class limitations.

#### ***Advanced Elective Courses by Program Pharmacology and Physiology -***

- Drug Discovery and Development I (McGonigle & Mathiasen)  
PHRM-525S (Spring)
- Drug Discovery & Development II (McGonigle & Mathiasen)  
PHRM-526S (Fall)
- New Frontiers in Therapy (Ajit)  
PHRM-581S (Fall)
- Methods in Biomedical Research (Gaskill)

PHRM-519S (Spring)

***Neuroscience -***

- Advanced Cellular & Developmental Neuroscience  
NEUR-511S (Spring)
- Advanced Systems and Behavioral Neuroscience  
NEUR-512S (Spring)
- Graduate Neuroscience I  
NEUR-508S (Fall)

***Microbiology & Immunology -***

- Advanced Molecular Biology  
MIIM-630S (Spring)
- Emerging Infectious Diseases  
MIIM-613S (Spring)
- Vaccines & Vaccine Development  
MIIM-524S (Spring)
- Immunology  
MIIM-508S (Fall)
- Molecular Pathogenesis I  
MIIM-512S (Fall)

***Molecular Cell Biology and Genetics -***

- Advanced Cell Biology  
MCBG-506S (Spring)
- Cell Cycle & Apoptosis  
MCBG-514S (Spring)
- Macromolecular Structure & Function  
MCBG-507S (Spring)

***Biochemistry***

- Writing for Researchers: Grants and Papers  
BIOC-511S (Spring)
- Biochemistry Experimental Approaches  
BIOC-508S (Fall)
- Cancer Biology  
BIOC-510S (Fall)

***Molecular Pathobiology***

- Cell & Molecular Biology of Cancer  
PATH-601S (Spring)

**PROGRAM OF STUDY FOR M.S. in Pharmacology & Physiology (Thesis track)**

**Committee Meetings and Program Documentation**

**It is the student's responsibility to assure that the appropriate paperwork is completed for Lab Rotation Evaluations, Preliminary Exams, Qualifying Exams, Thesis Committee Formation, Thesis Proposal Evaluation and Thesis Defense. Completed forms should be**

submitted to the Program Administrator and the Program Director and uploaded into the student portfolio.

Meetings between the student and his/her Thesis Committee serve to provide an objective, supportive and critical feedback evaluation of academic and scientific progress throughout Graduate School training. They are an essential part of the mentoring process. Committee meetings must be held every six months or more frequently if deemed necessary by the research advisor, student, or Thesis Committee. **It is the responsibility of each student to convene committee meetings** at a mutually convenient time and to provide evidence of such meetings in writing to the Program Director and the Biomedical Graduate Studies office via the "Dissertation Committee Meeting Report" form, which is completed by the Committee Chair.

### **C. Thesis Requirement**

**The laboratory for the thesis project must be selected by June of the first year.** The thesis project need not be independent but can be at the suggestion and guidance of the thesis advisor. The research project must be appropriate for completion and thesis defense, between the third and fourth year. Laboratory work begins during summer after the first year and continues through the second year.

### **D. Thesis Advisory Committee**

**By the end of the third semester (December 31), the student will propose members of the faculty to serve on the Thesis Advisory Committee subject to approval by the Steering Committee.** Once formed, this committee will meet every three months to review the student's progress. The committee consists of three voting members of the Committee who must be Graduate School faculty from the Pharmacology & Physiology Graduate Program. The student's major advisor is a voting member of the Committee but cannot chair the Committee. The Chair of the Committee must not be a collaborator on the student's research project and must not have any apparent conflicts of interest related to the publication or funding of the student's project. It is also the responsibility of the Chair to ensure that there is sufficient balance on the committee to ensure a rigorous and unbiased critique of the student's project and progress. There can be additional members of the committee that do not have voting rights. Following the Committee meetings, a brief statement of the student's progress must be prepared by the Committee chair and signed by each Committee member and submitted to the Program Director.

### **E. Thesis Proposal**

1. In lieu of the Qualifying Exam, Master's degree students will defend their thesis proposal to their thesis advisory committee. The Thesis Proposal document will be submitted by the student prior to completion of the Fall semester courses of the 2<sup>nd</sup> year of study. Under special circumstances this can be extended (approval must be obtained through written request to the Program Director and Steering Committee). The Thesis Proposal must be written in the style and within the page limitations of an NIH R21 grant application and handed in 10 working days prior to formal presentation of the Thesis Proposal to his/her Thesis Advisory Committee. The proposal should include a Specific Aims page and a Research Strategy with a limit of a single page for the Aims and 6 single-spaced pages for the Strategy using 12 pt font and 0.5" margins. Upon approval of the Thesis Proposal the student will continue with his/her thesis research, culminating on the

presentation of the M.S. thesis for defense.

2. At the time of the proposal the student will present an oral summary of his/her intended research project followed by a detailed question and answer session with the Thesis Advisory Committee. The proposal will last approximately 60 min.

3. The Thesis Advisory Committee will meet immediately following the defense and reach a decision. If the decision is positive, the student may continue with his/her thesis research. If the decision is negative, the student can re-submit a revised or new proposal in three months. If the Thesis Proposal is rejected a second time, the student will be either dismissed from the program or recommended for a non-thesis Master's degree. Recommendations to drop a student from the program completely or transfer into the Master's program must be reviewed and approved at a meeting of the Pharmacology and Physiology Steering Committee. The Director of the Graduate Program will submit any recommendations concerning the student (transfer to the Master's program or dismissal) for approval in accordance with the Biomedical Graduate Student Handbook Policies.

4. The format of the thesis has been described in detail by the Office of Biomedical Graduate Studies, and this format must be followed precisely.

#### **F. Thesis Defense**

1. A written thesis is required with an oral defense before the thesis advisory committee. A candidate may not present him/herself for the final thesis defense until he or she has completed at least 18 calendar weeks of residence after satisfactory completion of the Thesis Proposal, and has the approval of his/her thesis advisor.

2. At least four weeks prior to the date of the commencement at which the degree is to be conferred, printed or photocopied versions of the thesis must be distributed to each member of the advisory-examination committee. Also at this time, the Chair of the Committee, or the Program Coordinator must notify the Office of Biomedical Graduate Studies, the Registrar's Office and all departments involved in graduate education of the scheduled date of the thesis defense.

3. The thesis defense will take place no less than two weeks and no more than four weeks after the thesis has been distributed to the members of the examination committee, except under written direction of the Steering Committee.

4. The thesis defense will be public. The candidate will be formally introduced by his/her advisor or the Chair of the Committee. The candidate will present a 45-minute seminar on his/her research, followed by questions from the Examination Committee and the general audience. After this initial question and answer period, the chair will dismiss the audience. The Examination Committee will meet in private with the candidate to complete the examination process.

5. The Thesis Examination Committee shall decide upon the merits of the candidate's performance on the thesis defense. To be recommended for a Master's degree, the candidate must receive unanimous approval of the Committee. By permission of the Committee a candidate who has failed the final thesis defense may present him or herself for re-examination after three, but not more than twelve months. This re-examination must be taken within a calendar year of failure to pass the first examination. A report on each final thesis defense whether passed, failed, or recommended for re-examination must be filed by the Committee in the Office of Biomedical Graduate Studies.

6. At least four weeks prior to the commencement at which the degree is to be conferred, three copies of the completed thesis suitable for binding and bearing the approval of the advisory-

examination Committee must be deposited in the Office of Biomedical Graduate Studies. One of these copies is to be placed on file in the COM Library, Graduate Office and the Pharmacology & Physiology Main Office. An unbound copy of the thesis must also be presented to the Office of Biomedical Graduate Studies for microfilming by University Microfilms, Ann Arbor Michigan. The abstract will be published in Dissertation Abstract by University Microfilms. The cost of preparation, reproduction and personal binding copies are the candidate's responsibility.

## **PROGRAM OF STUDY FOR M.S. IN PHARMACOLOGY & PHYSIOLOGY (Non-Thesis track)**

### **A. Course Requirements**

The Pharmacology & Physiology Program offers a non-thesis MS degree in which students can earn the degree by taking graduate classes and writing a literature review paper as opposed to conducting original laboratory research. The requirements for a M.S. degree without thesis as mandated by the Biomedical Graduate Program Committee of the COM are a minimum of 36 credit hours of course work (with a 3.0 or higher GPA) consisting of the Core Curriculum, Biostatistics, Responsible Conduct of Research (17 credit hours), required Pharmacology & Physiology program courses (at least 16 credit hours, listed on pages 2-3 of this document), and preparation of a scholarly paper (Literature Review, 4 credit hours). Neither lab rotations nor thesis research credits count toward this degree.

Courses outside of the Pharmacology & Physiology program may be taken on the advice and discretion of the Program Director and the faculty mentor. Credit for a graduate course requires a minimum grade of "B." The student must choose a faculty mentor in the first year, no later than June 30. The role of the mentor is to provide guidance in selecting the topic for the scholarly paper, and in helping the student perform the literature search, and, in writing the document. The selected topic must be approved by Steering Committee of the Pharmacology & Physiology Program.

### **B. Scholarly Paper Review**

The scholarly paper reviews a topic in detail based on the primary research literature. The body of the paper must be 35-50 double spaced pages (12 pt font). This page number does not include citations, but citations must be provided as well. The following format must be followed:

- Abstract (250 words)
- Body of Paper
- Introduction – what is the purpose and scope of the review
- Literature review – review and contrast findings in the field; identify unresolved issues and shortcomings of technical approaches
- Summary – what are the key findings of the review
  - Conclusion- what gaps in our knowledge or unanswered questions emerge from the review; what are potential future directions for research in this area.

Successful completion of the literature review will be subject to the approval of the mentor/advisor and the Steering Committee.

## **TRANSFERING BETWEEN DOCTORAL AND M.S. PROGRAMS**

Under certain circumstances, the faculty may recommend that a student be transferred from the M.S. program to the Ph.D. program, transferred from the Ph.D. program to the M.S. program, or transferred from the Ph.D. program or the thesis-oriented M.S. program to the non-thesis M.S. option. Students may elect to apply for program transfers with the approval of the Program Director. M.S. student transfer to the Ph.D. program will require formal application to the PhD program, adherent to the standard procedure and timeline.

### **CODE OF BEHAVIOR**

The Graduate Program in Pharmacology & Physiology subscribes to the **Code of Professionalism** ([http://drexel.edu/~media/Files/medicine/drexel-pdfs/graduate-school/Drexel\\_BSP\\_Student\\_Handbook\\_2015-16\\_v4](http://drexel.edu/~media/Files/medicine/drexel-pdfs/graduate-school/Drexel_BSP_Student_Handbook_2015-16_v4)) for all of its members. This policy states that professional behavior appropriate to a faculty and students in an academic research setting is expected and required at all times. Admission to and continued participation in the Graduate Program is therefore contingent upon the student's understanding of this policy, and his/her agreement to adhere to its guidelines.

### **CODE OF ETHICS**

The Graduate Program in Pharmacology & Physiology subscribes to the **Code of Academic Integrity** (presented in its complete form in the Student Handbook, ([http://drexel.edu/~media/Files/medicine/drexel-pdfs/graduate-school/Drexel\\_BSP\\_Student\\_Handbook\\_2015-16\\_v4](http://drexel.edu/~media/Files/medicine/drexel-pdfs/graduate-school/Drexel_BSP_Student_Handbook_2015-16_v4)) for all its members. This policy states that cheating, plagiarism, forgery, or other forms of academic misconduct are not tolerated at our institution. Admission to and continued participation in the Graduate Program is therefore contingent upon the student's understanding of this policy, and his/her agreement to adhere to its guidelines.

## **Disability Resources**

Students [requesting accommodations](#) due to a disability at Drexel University need to request a current Accommodations Verification Letter (AVL) in the [ClockWork database](#) before accommodations can be made. These requests are received by Disability Resources (DR), who then issues the AVL to the appropriate contacts. For additional information, visit the [DR website](#), or contact DR for more information by phone at 215.895.1401, or by email at [disability@drexel.edu](mailto:disability@drexel.edu).

## **Tutoring**

The **Center for Learning and Academic Success Services (CLASS)** attempts to provide a tutor for all courses and ancillary subjects, such as test-taking, writing, study skills, and computer skills. Tutoring is a free service. For more information, please contact [CLASS](#) and [Center for Academic Success](#). The office is located at this Drexel University, Center City Campus, New College Building, 245 N. 15th St, Suite 1602, Mail Stop 526, Philadelphia, PA 19102, Phone: 215-762-8121.

To schedule tutoring appointments through Accudemia, log in to [Drexel One](#), select the "Academics" tab and follow the link to Accudemia in the "Academic Support" section. View instructions on scheduling an appointment: [How to Make a Tutoring Appointment \[DOC\]](#). Please find additional information on [how to schedule tutoring appointments and FAQ regarding tutoring](#).

## **Language support**

For ESL or language support, please contact the [University's English Language Center](#). In addition, the [university writing center](#) is available to support all students with their written work.