PHYSIOLOGY (PHD)

Doctor of Philosophy in Physiology
Unit: School of Medicine (http://louisville.edu/medicine/) (GM)  
Department Website: Physiology (https://louisville.edu/medicine/departments/physiology/)  
Program Website (https://louisville.edu/medicine/departments/physiology/degrees/phd-ph/)  
Academic Plan Code(s): PHZBPHD

Program Information

Program Overview and Objectives
The Department of Physiology is located in the Health Sciences Center of the University of Louisville, which provides an active and intellectually stimulating environment and a wide variety of course options. The graduate program permits studies in related disciplines, such as anatomy, neurobiology, pharmacology, toxicology, biochemistry, microbiology, immunology, and molecular biology.

The doctoral program of the Department of Physiology is offered through the School of Medicine at the University of Louisville. As such, one major goal of the Department is to provide students with advanced training, which leads to the PhD degree in Physiology. The research interests of the Department are broad enough to provide each student with a wide selection of possible research and graduate education opportunities. Our doctoral graduate program is designed primarily to prepare students for an independent research career in basic and applied physiology.

Faculty Advising

First-Year Temporary Advisor and Research Experience
The Director of Graduate Studies will meet with the new student to discuss the student’s academic and research interests. The Director of Graduate Studies will serve as a Temporary Advisor until a Permanent Advisor is selected.

Selection of Principal Advisor
During the first semester, beginning graduate students will visit research laboratories in which they have an interest. First-year graduate students must select a Principal Advisor within the first five months of their graduate study. The selection process involves approval by the student, the Principal Advisor, the Director of Graduate Studies, and the Department Chair. The Principal Advisor must be a Graduate Research Training Faculty of the School of Medicine.

Advisory Committee
The Advisory Committee in this Department is an integral part of the graduate student’s training. This Committee is to be extremely proactive in planning the student’s curriculum and providing an appropriate breadth in the student’s research experience. To that end, not only does the mentor provide guidance in developing the dissertation research plan, but the Advisory Committee has the additional responsibility to assure the independent research design will provide appropriate results for the proposed hypotheses.

After selection of the Principal Advisor, the graduate student’s Advisory Committee will be determined. This Committee must have at least five members, and will contain: the Principal Advisor, as Chair; at least three Departmental faculty members; and at least one Graduate Faculty member from outside the Department. All must be appointed as Members of the School of Medicine Graduate Faculty.

In cases where the Principal Advisor holds a primary appointment in a department other than the Department of Physiology, one of the full-time Physiology Faculty will serve as Co-Advisor. The Co-Advisor will also serve on the student’s Advisory Committee and serve as the Second Reader of the Dissertation Reading Committee.

Approval of the Committee membership by the Director of Graduate Studies and the Chair will be contingent upon the potential role of each Committee member in the training or in the career plans of the student. The Dissertation Defense Committee, selected by the Principal Advisor, must be approved by the Director of Graduate Studies, the Department Chair, and by the Dean of the School of Medicine (or his/her designee).

Admission Requirements

The University of Louisville Graduate School gives a general description of admission procedures. Application information can be found on the Graduate School website (http://louisville.edu/graduate/)

The following application items must be submitted to the Graduate School, at the University of Louisville.

1. Graduate application (http://louisville.edu/graduate/futurestudents/apply-materials/application/).
2. One official transcript of the applicant’s previous work for each college or university that has been previously attended.
3. Two letters of recommendation from people who are well acquainted with the applicant’s previous academic work.
4. TOEFL, IELTS or Duolingo Examination scores for foreign students from non-English speaking countries.
5. A non-refundable application fee to the University of Louisville.
6. Applicants must state in a letter to the Department but submitted to the Graduate School (referred to as the Personal Statement in the application materials), why they desire a PhD degree in this Department of Physiology and Biophysics.

Applicants for combined degrees (MD/PhD or PhD/DMD) must apply and be accepted by the appropriate professional school (e.g., School of Medicine or Dentistry) before final action will be taken on the Departmental doctoral application.

Admission to the PhD program in the Department of Physiology requires:

- A genuine interest in graduate work and the desire for a significant independent research career in the health sciences
- A cumulative undergraduate grade point average that is usually 3.00 or higher on a scale of 4.00
- International students for whom English is not their primary language must show English language proficiency by demonstration of proficiency on the TOEFL examination (defined as 213 or higher on the computer-based test; >85 on the internet exam), IELTS scores of at least 6.5 overall band score from the academic module exam, Duolingo score of 105 or by successfully completing the exit examination for the advanced level of the Intensive English as a Second Language Program or by demonstration of a degree award from an acceptable English language institution.

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Program Requirements

Minimum Course Requirements

The University of Louisville PhD degree does not require a specific number of hours of academic credit. However, the Department requires that a minimum of two consecutive semesters—nine (9) credit hours in the Fall or Spring semesters and/or six (6) credit hours in the Summer—to be taken to fulfill the full time one-year doctoral residency requirement at the University of Louisville. With the approval of the Dean of the School of Medicine (or his/her designee), a maximum of 12 credit hours of this requirement may be credited for post-baccalaureate work from other professional or graduate degree programs.

By the end of the program, the student also must demonstrate the ability to conduct independent research.

The required program of academic studies must include (if not completed with a grade of B or better prior to admission to the Department) the following courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHZB 605</td>
<td>Systemic Physiology I</td>
<td>1</td>
</tr>
<tr>
<td>&amp; PHZB 606</td>
<td>Systemic Physiology II (or equivalent)</td>
<td>9</td>
</tr>
<tr>
<td>BIOC 645</td>
<td>Advanced Biochemistry I (or equivalent)</td>
<td>4</td>
</tr>
<tr>
<td>BIOC 647</td>
<td>Advanced Biochemistry II</td>
<td>4</td>
</tr>
<tr>
<td>PHZB 611</td>
<td>Advanced Human Cardiovascular Physiology (or equivalent)</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 667</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>PHZB 609</td>
<td>Integrated Systemic Physiology</td>
<td>3</td>
</tr>
<tr>
<td>PHZB 617</td>
<td>Seminar in Physiology and Biophysics (two semesters)</td>
<td>2</td>
</tr>
<tr>
<td>PHZB 616</td>
<td>Selected Topics in Physiology and Biophysics (or equivalent)</td>
<td>3</td>
</tr>
<tr>
<td>PHZB 625</td>
<td>Experimental Physiology Methods</td>
<td>1</td>
</tr>
<tr>
<td>BIOC 630</td>
<td>Responsible Conduct of Research: Survival Skills and Research Ethics</td>
<td>1</td>
</tr>
</tbody>
</table>

Minimum Total Hours: 34

A student must have at least a 3.00 accumulated GPA (on a 4.0 scale) in order to take the PhD Qualifying Examination and to qualify for the PhD degree. In general, a student with a GPA of less than 3.00 after two consecutive semesters (excluding summer sessions) will require a two-thirds majority vote of the Departmental faculty to continue in the PhD Program. The student must have received more than six (6) credit hours of a grade of C in required courses.

For Departmental purposes, passing grades in pass/fail graded courses will not be included in the GPA calculation; however, a failing grade in a pass/fail graded course will be included in the GPA calculation at zero quality points per credit hour. Students will not be allowed to graduate with failing grades on their transcript.

Minimum Requirements for the Doctor of Philosophy Degree in Physiology

The PhD degree is designed for the student who wishes a professional life that involves original, independent research and who desires knowledge that will permit competent advanced teaching in a physiology area. The PhD degree requires that the student reach a high level of creativity and expertise. Therefore, mere completion of a prescribed number of courses is not adequate for receipt of the doctoral degree. All PhD students are expected to make steady and satisfactory progress toward the completion of the degree.

To document the satisfactory progress of the PhD students, each Advisory Committee must hold at least two mandatory, semi-annual meetings and report on the student’s progress (presentations, publications, grades and research progress). The mentor will submit a written report to the Director of Graduate Studies who will collate and distribute these reports to the faculty. Twice a year, the Director of Graduate Students will lead a Departmental faculty discussion of these reports to determine the student’s progress.

The PhD Qualifying Examination

Before the PhD Qualifying Examination may be taken, the student must have completed the Minimum Course Requirements listed above with a GPA of at least 3.0. It would normally be expected that the student would take the PhD Qualifying Examination by the end of five semesters of graduate studies. If the student has not taken the PhD Qualifying Examination by the end of the second year, a letter of justification for the delay must be submitted by the Principal Advisor to the Department Chair.

A PhD Qualifying Examination must be passed by the applicant in order to be admitted to doctoral candidacy. The Qualifying Examination Committee will be comprised of members of the student’s Advisory Committee. The membership must be approved by the Director of Graduate Studies and the Department Chair. A passing recommendation shall not involve more than one negative vote of this Committee. If the student does not pass the Qualifying Examination, one additional retake will be allowed if approved by a majority vote of the Departmental faculty.

The purpose of the PhD Qualifying Examination is to test the student’s independent use and depth of core physiology through its application to the student proposed research. This examination shall consist of a written research proposal outlining the dissertation research and an oral examination of the student’s depth of current understanding of the basic physiological concepts underlying the proposed research. The student will receive the Master of Science Degree in Physiology upon satisfactory completion of the Qualifying Exam.

Maintenance of Graduate Status

A candidate for the PhD degree who has completed all residency requirements, all of the approved required program of academic studies, and passed the Qualifying Examination may register for DOCT 600 Doctoral Candidacy to maintain doctoral candidacy until the degree is awarded. Continuous registration in this status is required. Semiannual progress meetings will continue to be expected. To complete the PhD degree, the student must continue to make satisfactory progress during the candidacy period. In order to be eligible to receive the PhD degree, the student must have been admitted to candidacy and registered for doctoral candidacy for the two consecutive semesters prior to the awarding of the degree.

Dissertation

The dissertation shall represent a scholarly achievement which embodies results of independent research and which demonstrates a thorough understanding of research concepts in the field of inquiry. The completed dissertation must be in the appropriate format as required by the Graduate School and must be approved by a Dissertation Reading Committee (the Candidate’s Advisory Committee). Then, at least two
weeks before the scheduled dissertation defense and at least thirty
days before the expected date of graduation, the dissertation shall be
submitted to the Dissertation Defense Committee. The Dissertation
Defense Committee, selected by the Principal Advisor, must have
been approved previously by the Director of Graduate Studies, the
Department Chair, and by the Dean of School of Medicine (or his
designee) (see section IIIC). The accepted dissertation, must be submitted
electronically, one signed signature page signed by the Dissertation
Defense Committee, must be deposited with the Graduate School by
the published deadline (http://louisville.edu/graduate/current-students/
thesis-dissertation-information/) and one copy must be given to the
Department Chair before graduation. The copy for the Department Chair
may be electronic.

Dissertation Defense
The dissertation defense is an oral defense of the dissertation and a
demonstration of mastery of the candidate’s research field. The defense
is administered by the Dissertation Defense Committee. The defense
of the dissertation is a public examination and the Graduate School
will notify all faculty members that they are invited to the Dissertation
Defense, but only members of the Dissertation Defense Committee
will vote on the student’s performance. For the student to pass the
Dissertation Defense, the vote of the Dissertation Defense Committee
may not include more than one negative vote. The Dissertation Defense
must take place at least fourteen days before the end of the semester in
which the degree is anticipated.

The Department will not approve the granting of the PhD degree until
the student has submitted at least one first-authored manuscript on the
dissertation research and one co-authored manuscript for publication in
a refereed journal. The manuscript and the choice of a journal must be
approved by the Principal Advisor before manuscript submission.

In any case, where the Departmental requirements are less restrictive
than those described in the School of Medicine Minimal Guidelines for
Graduate Education, the School of Medicine guidelines will apply.

Exceptions
1. The above are statements of minimum Departmental requirements.
   However, it is recognized that there could be special and unusual
cases in which rare exceptions should be allowed. The student and
   advisor should consult with the Department Chair if an exception is
desired.

2. In the above guidelines, the Director of Graduate Studies has
   considerable responsibility for program quality. To avoid any
   possibility of a potential conflict of interest, the Department Chair (or
designee) will fulfill the role of Director of Graduate Studies for any
   PhD or MS student who has the Director of Graduate Studies as their
   Principal Advisor.

Typical Doctoral Programs

Traditional Doctoral Program

<table>
<thead>
<tr>
<th>Year 1</th>
<th></th>
<th>Hours</th>
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<tbody>
<tr>
<td>Fall</td>
<td>BIOC 645 Advanced Biochemistry I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>PHZB 605 Systemic Physiology I</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>PHZB 617 Seminar in Physiology and Biophysics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PHZB 619 Research</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PHZB 625 Experimental Physiology Methods</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Hours</td>
<td>12</td>
</tr>
</tbody>
</table>

\[
\text{Total Hours: 12 hours (Year 1)}
\]

\[
\text{Minimum Total Hours: 52 hours (Doctoral Program)}
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Dissertation Defense: If more research/dissertation time is needed, the
student will continue to register as DOCT 600 until completed.

Doctoral Program for Residents/Fellows
This sequence is based on the premise that the clinician will be given the
equivalent of two full calendar years (“Research Leave”) free to complete
research without clinical duties. The Director of Graduate Studies will
see that the Graduate School is notified of the transfer of the preclinical
courses applicable to the Departmental doctoral requirements. The
clinician will take:

1. Advanced Human Physiology,
2. Integrated Systemic Physiology,
3. Statistics,
4. Two semesters of Seminar, and
5. Complete initial research (PHZB 619) to define a doctoral research problem.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Fall</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>PHZB 609 Integrated Systemic Physiology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PHZB 619 Research</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>PHZB 617 Seminar in Physiology and Biophysics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Hours</strong></td>
<td></td>
</tr>
</tbody>
</table>

| Spring | PHZB 611 Advanced Human Cardiovascular Physiology | 3     |
|        | BIOC 630 Responsible Conduct of Research: Survival Skills and Research Ethics | 1     |
|        | PHZB 619 Research | 5     |
|        | PHZB 616 Selected Topics in Physiology and Biophysics | 3     |
|        | **Total**          | **12**|
|        | **Hours**          |       |

| Summer | PHZB 619 Research | 6     |
|        | **Total**          | **6**  |

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PHZB 619 Research</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td><strong>Master of Science Degree (PhD Qualifying Exam)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

| Spring | DOCT 600 Doctoral Candidacy | 0     |
|        | **Total**          | **0**  |

| Summer | DOCT 600 Doctoral Candidacy | 0     |
|        | **Total**          | **0**  |

**Minimum Total Hours**: 38

**Dissertation Defense**: If more research/dissertation time is needed, the clinician will continue to register as DOCT 600, until completed, and dissertation defended.