INTEGRATIVE AND BIOMEDICAL PHYSIOLOGY

The Intercollege Graduate Degree Program (IGDP) in Integrative and Biomedical Physiology will enable students to obtain interdisciplinary training encompassing both the fundamentals of biomedical physiology and advanced training in a specialized area, in preparation for varied biomedical careers in academia or industry. This IGDP is uniquely focused on the study of integrative mechanisms of mammalian body systems at the molecular, cellular, tissue, and organ levels, and the application of that knowledge to study a number of human diseases and conditions. A broad range of research is conducted by faculty, all of whom are widely regarded in their respective fields. Subspecialization areas include aging, exercise and muscle biology, biophysics, cancer, cardiovascular regulation and disease, energy and nutrient regulation, immunology and inflammation, obesity and diabetes, and reproductive biology. The master's program, including courses, laboratory experience, and original research, is designed for completion in approximately two years, while the doctoral degree requires approximately five years.

Graduate instruction in integrative and biomedical physiology is under the direction of graduate faculty from multiple colleges and departments at University Park—including animal science, biochemistry, biology, bioengineering, biomedical engineering, kinesiology, and nutrition, as well as veterinary and biomedical sciences.

Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (http://gradschool.psu.edu/prospective-students/how-to-apply). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions (http://gradschool.psu.edu/graduate-education-policies).

Scores from the Graduate Record Examinations (GRE) are required for admission. At the discretion of the graduate program, a student may be admitted provisionally (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/provisional-admission) for graduate study in a program without these scores if MCAT scores are available.

Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces that are available for new students. Exceptions to the minimum 3.00 grade-point average may be made at the discretion of the program for students with special backgrounds, abilities, and interests. Deficiencies in chemistry, biological science, mathematics (through a second course in calculus), and physics must be made up early in the student’s graduate program. The majority of students are admitted directly into the Ph.D. program.

Degree Requirements

Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements. (http://gradschool.psu.edu/graduate-education-policies)

M.S. degree students must complete a minimum of 30 credits for the degree, including 20 core credits in:

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHSIO 571</td>
<td>Integrative and Cellular Mammalian Physiology I</td>
<td>3</td>
</tr>
<tr>
<td>PHSIO 572</td>
<td>Integrative and Cellular Mammalian Physiology II</td>
<td>3</td>
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<tr>
<td>NUTR 501</td>
<td>Regulation of Nutrient Metabolism I</td>
<td>4</td>
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<tr>
<td>MCIBS 591</td>
<td>Ethics in the Life Sciences</td>
<td>1</td>
</tr>
<tr>
<td>STAT 500</td>
<td>Applied Statistics</td>
<td>3</td>
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<tr>
<td>3 credit course in immunology</td>
<td>3</td>
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</tr>
<tr>
<td>3-credit course in molecular biology</td>
<td>3</td>
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<tr>
<td>Total Credits</td>
<td>20</td>
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At least 6 credits in thesis research (PHSIO 600 or PHSIO 610) must be taken in conjunction with the thesis. The thesis must be accepted by the advisers and/or committee members, the head of the graduate program, and the Graduate School, and the student must pass a thesis defense which includes a public presentation. Students in the non-thesis option must write a satisfactory scholarly paper, while enrolled in PHSIO 596.

Doctor of Philosophy (Ph.D.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Requirements. (http://gradschool.psu.edu/graduate-education-policies)

All candidates must complete rotations in physiology laboratories before choosing an area of specialization. Possible areas of specialization include cellular, molecular, animal or human aspects of the following:

- cardiovascular and respiratory physiology
- comparative physiology
- environmental physiology
- exercise physiology
- muscle physiology
- physiology of nutrition and metabolism
- immunology
- neurophysiology
- reproductive physiology

Students in the Ph.D. program must successfully pass the qualifying, comprehensive, and final oral examination (the dissertation defense) required by Graduate Council. To earn the Ph.D. degree, doctoral students must also write a dissertation that is accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School. The Ph.D. committee shall be appropriately represented by members of the Integrative and Biomedical Physiology faculty and those of the area of specialization who shall have the responsibility and jurisdiction for determining the course program and research acceptable in satisfying degree requirements.
The doctoral degree in Integrative and Biomedical Physiology requires a minimum of 30 credits, including:

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</tr>
<tr>
<td>PHSIO 590</td>
<td>Colloquium</td>
<td>2</td>
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<tr>
<td>STAT 501</td>
<td>Regression Methods</td>
<td>3</td>
</tr>
<tr>
<td>STAT 502</td>
<td>Analysis of Variance and Design of Experiments</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3-credit course in immunology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3-credit course in molecular biology</td>
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**Electives**

The remaining 5 credits may be chosen from 500-level Physiology courses or other relevant 400- or 500-level course. For a list of suggested courses, contact the graduate program.

Total Credits: 30

Students must earn a grade of B or better in each course and maintain an overall average of 3.00.

**Minor**

Requirements listed here are in addition to requirements for minors in Graduate Council policies listed under GCAC-600 Research Degree Requirements (http://gradschool.psu.edu/graduate-education-policies) and GCAC-700 Professional Degree Requirements (http://gradschool.psu.edu/graduate-education-policies).

The objective of the doctoral minor in Integrative and Biomedical Physiology is to augment the training of doctoral students with a coordinated group of courses that provide an integrated perspective of physiology from the molecular to the organismal level. It is expected that most students pursuing the minor will be graduate degree candidates in basic biological sciences, health sciences, or bioengineering.

The doctoral minor in Integrative and Biomedical Physiology requires the following:

- BIOL 472 - If the student took a one-semester, upper-level undergraduate mammalian physiology course as an undergraduate, then this requirement may be waived with approval by the chair of the Integrative and Biomedical Physiology program.
- PHSIO 571 and PHSIO 572 - If these courses are required for the major, then substitute an equal number of credits in 500-level Integrative and Biomedical Physiology elective courses.
- A 3-credit, 500-level Integrative and Biomedical Physiology elective course.
- Select additional credits from 500-level Integrative and Biomedical Physiology courses or a relevant 400- or 500-level course so that the total course credits for the minor is 15. These 15 credits cannot include course work that is used to fulfill requirements in the student’s major.
- Elective courses for the minor must be approved by the chair of the Integrative and Biomedical Physiology program. For a list of suggested courses, contact the graduate program.

- Students must earn a grade of C or better in each course in the minor and maintain an overall average of 3.00 in the minor.
- One member of the Ph.D. committee must be a faculty member in the Intercollege Graduate Degree Program in Integrative and Biomedical Physiology.

**Student Aid**

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (http://gradschool.psu.edu/graduate-funding) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (http://gradschool.psu.edu/graduate-education-policies/gsad/gsad-900/gsad-901-graduate-assistants) set by The Graduate School.

**Courses**

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Physiology (PHSIO) Course List (https://bulletins.psu.edu/university-course-descriptions/graduate/phsio)

**Contact**

**Campus**

**Hershey Med Ctr**

**Graduate Program Head**

Donna Hope Korzick

**Program Contact**

Kathy Elaine Shuey

Penn State University College of Medicine

Physiology Dept. H166, 500 University Dr.

Hershey PA 17033

kes6@psu.edu

(717) 531-8982

**Program Website**

View (http://www2.med.psu.edu/physiology)

**University Park**

**Graduate Program Head**

Donna Hope Korzick

**Program Contact**

Terrie Louise Young

101 Life Sciences Building

University Park PA 16802

tly2@psu.edu

(814) 863-3273

**Program Website**

View (https://www.huck.psu.edu/graduate-programs/integrative-and-biomedical-physiology)