Twin Cities Campus

Integrative Biology and Physiology Ph.D.

Integrative Biology and Physiology

Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Integrative Biology and Physiology, Jackson Hall 6-125, 321 Church Street SE, Minneapolis, MN 55455 (612-625-5902; fax: 612-301-1543)
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- Program Type: Doctorate
- Requirements for this program are current for Spring 2021
- Length of program in credits: 55
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Physiology may be defined as the application of mathematics, physics, and chemistry to the study of structure and function in living systems. As such, physiology is a "hybrid" field in which expertise from many other disciplines is ordinarily required and combined.

The program emphasizes a quantitative approach to understanding the functions of cells, organs, and systems in living animals. PhD students take a core concentration that provides a broad background in the physiology of membranes, cells, transport, and organ systems. Individualized programs are structured to build on the student's strengths and to fill in gaps that would otherwise be an impediment to specific problem solving. Teaching experience is also available to all students.

The graduate program in the Twin Cities has cardiovascular, hypertension and metabolism emphases, although many other areas of specialization are represented.

Students can enter the PhD program from the Twin Cities or Duluth campus. Highly qualified individuals with solid quantitative backgrounds are encouraged to apply. In the Twin Cities, prospective students also include people with previous medical training who are already at the University of Minnesota or are considering the University of Minnesota Medical School for residency or fellowship training.

Entering PhD students are expected to take a series of laboratory rotations to familiarize themselves with active areas of research within the degree program. The program includes faculty and corresponding research laboratories from the Department of Integrative Biology and Physiology and also the Departments of Medicine; Surgery; Neuroscience; Neurosurgery; Biochemistry, Molecular Biology, and Biophysics; Pharmacology; Physical Medicine and Rehabilitation; Kinesiology; and Animal Science.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

Other requirements to be completed before admission:
An undergraduate degree with at least one year (three quarters or two semesters) of calculus, one year of physics, one year of biology, and two years of chemistry is required. For the minor, a background in mathematics, physics, chemistry and biology acceptable to the graduate faculty is required.

Special Application Requirements:
There are no minimum GPA or GRE score requirements. All applicants need three letters of recommendation. Admission to the program begins in the Fall semester.
International applicants must submit score(s) from one of the following tests:

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Information current as of March 28, 2024

- TOEFL
  - Internet Based - Total Score: 107
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 625
- IELTS
  - Total Score: 6.5

Key to test abbreviations(TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

31 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

During the first year, students rotate through three to four laboratories, attend weekly seminars, choose an advisor, and begin a research project.

All coursework must be taken A/F and with an earned grade of B or higher unless offered S/N only.

Required Coursework (21 credits)

Take the following courses in consultation with the advisor. Take PHSL 8232 in conjunction with PHSL 5101; 2 credits of PHSL 5701; and 2 credits of PHSL 8294, on an S/N grade basis, at least twice for 4 credits.

ANSC 5702 - Cell Physiology (4.0 cr)
BIOC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
PHSL 5101 - Human Physiology (5.0 cr)
PHSL 5197 - Stress Physiology (1.0 - 3.0 cr)
PHSL 5701 - Physiology Laboratory (1.0 - 2.0 cr)
PHSL 8232 - Critical Reading of Journal Articles in Physiology (2.0 cr)
PHSL 8242 - Professional Skills Development for Biomedical Scientists (2.0 cr)
PHSL 8294 - Research in Physiology (1.0 - 18.0 cr)

PhD Seminar (4 credits)

Take PHSL 5096 at least 4 times for a total of 4 credits.
PHSL 5096 - Integrative Biology and Physiology Research Advances (1.0 cr)

Molecular Biology and Genetic Coursework (3 credits)

Select at least 3 credits from the following, in consultation with the advisor.
BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
BIOC 6021 - Biochemistry (3.0 cr)
BIOL 4003 - Genetics (3.0 cr)
BIOL 4004 - Cell Biology (3.0 cr)
GCD 5036 - Molecular Cell Biology (3.0 cr)

Biostatistics Coursework (3 credits)

Select at least 3 credits from the following, in consultation with the advisor.
PUBH 6414 - Biostatistical Literacy (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)

Thesis Credits (24 credits)

Take 24 credits of doctoral thesis credits.

PHSL 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)