

# INTEGRATED PHYSIOLOGY (PHD)

## Overview

Integrated Physiology is a multidisciplinary PhD training program that prepares students for careers in biomedical research. Students in Integrated Physiology have opportunities to explore how cells, organ systems and organisms regulate complex physiological functions through integration of molecular, cellular and physiological mechanisms.

## Entrance Requirements

The Integrated Physiology Program seeks highly motivated students with the strong backgrounds in quantitative sciences and a passion for biomedical research.

**GPA and Test Scores (optional)** | The average undergraduate GPA of accepted students is 3.40. If you are submitting GRE scores, take the exam no later than October so that their scores will be available to the Program.

**Coursework and Research** | Students seeking admission should have taken Organic Chemistry, Biology, General Physics, and college level mathematics through Calculus. Courses in Biochemistry, Physical Chemistry, Genetics and Physiology are recommended. Research experience is strongly recommended. Students with excellent records and research experience who lack specific courses are encouraged to apply. Where additional course-work is necessary to provide background of sufficient depth for our rigorous curriculum, supplemental courses or reading programs can be designed.

### How to Apply

Application will open on September 1st.

DEADLINE FOR APPLICATIONS IS DECEMBER 1st.

PRIORITY DEADLINE FOR INTERNATIONAL APPLICANTS IS NOVEMBER 1.

To apply for admission applicants must submit the following:

- Online Graduate School application.
- A \$50.00 domestic and \$75.00 international non-refundable application fee [credit card (on-line only), check, or money order]. No application will be processed unless this fee is paid.
- Three (3) letters of recommendation.
- GRE test scores (optional)
- TOEFL or IELTS scores and financial support verification (international students only).
- One (1) official transcript of all academic work completed to date. To be considered "official", the transcripts must come from the issuing institution directly to the University of Colorado Denver Graduate Admissions.

Electronic Transcripts should be sent to:  
graduate.school@cuanschutz.edu

If sending a physical transcript, please mail to:

University of Colorado Denver  
Graduate School

Mail Stop C296  
Fitzsimons Building, C5000  
13001 E. 17th Place  
Aurora, CO 80045

International students must meet ALL of the requirements above and those required by International Admissions.

## Plan of Study

### First Year

Year 1		Hours
Fall		
BMSC 7806	Core I: Foundations in Biomedical Sciences	6
BMSC 7810	Core Topics in Biomedical Science	2
IPHY 7650	Research in Integrated Physiology	2
IPHY 7652	Special Topics in Integrated Physiology	1
<b>Hours</b>		<b>11</b>
<b>Total Hours</b>		<b>11</b>

Year 1		Hours
Spring		
IPHY 7650	Research in Integrated Physiology	1
IPHY 7652	Special Topics in Integrated Physiology	1
IPHY 7800	Comprehensive Physiology	6
IPHY 7803	Signaling in Physiological Systems	3
<b>Hours</b>		<b>11</b>
<b>Total Hours</b>		<b>11</b>

Year 1		Hours
Summer		
IPHY 8990	Doctoral Thesis	1-10
<b>Hours</b>		<b>1-10</b>
<b>Total Hours</b>		<b>1-10</b>

### Second Year

Students are required to take one advanced topics or elective course in their second year. Electives should be chosen in consultation with the Program Director and the student's mentor.

Year 2		Hours
Fall		
BMSC 7811	Responsible Conduct of Research	1
BMSC 7820	Statistics and Data Analyses for the Biomedical Sciences	3
IPHY 7650	Research in Integrated Physiology	1-10
IPHY 7652	Special Topics in Integrated Physiology	1
<b>Hours</b>		<b>6-15</b>
<b>Total Hours</b>		<b>6-15</b>

Year 2		Hours
Spring		
IPHY 7650	Research in Integrated Physiology	1-10
IPHY 7652	Special Topics in Integrated Physiology	1
CANB 7620	Histophysiology	3
IPHY 7802	Grant Proposal Writing	1

BMSC 7812	Rigor and Responsibility in Biomedical Research	1
	<b>Hours</b>	<b>7-16</b>
	<b>Total Hours</b>	<b>7-16</b>

**Year 2**

<b>Summer</b>		<b>Hours</b>
IPHY 8990	Doctoral Thesis	1-10
	<b>Hours</b>	<b>1-10</b>
	<b>Total Hours</b>	<b>1-10</b>

**Third Year & Beyond**

<b>Year 3</b>		<b>Hours</b>
IPHY 7652	Special Topics in Integrated Physiology	1
IPHY 8990	Doctoral Thesis	1-10
	<b>Hours</b>	<b>2-11</b>
	<b>Total Hours</b>	<b>2-11</b>

**Learning Objectives****Graduate education in general**

Doctoral education is the foundation of future scholarship and the primary “engine” driving the research enterprise. It prepares future faculty and leaders in academia as well as in many other areas of industry, government, and society in general.

**Integrated Physiology program in specific**

Understanding mechanisms underlying the function of various systems in the body that contribute to both normal and pathological physiology is the fundamental prerequisite for all applied research in biology. Doctoral education in Integrated Physiology trains students in basic integrated physiology concepts spanning multiple organ systems from molecular/cellular physiology to systems physiology using state of the art approaches.

The philosophy of our graduate program is to emphasize state-of-the-art research approaches at all stages; and that begins with the recruitment phase. We identify candidates with excellent undergraduate academic credentials, with a strong preference for those who have participated in independent research. During the first year in the program, students must complete three formal laboratory-based research rotations. Each research rotation is intended to examine testable hypotheses, as well as to provide exposure to new laboratory techniques. At the conclusion of each rotation, a post-rotational seminar is presented to the Program Faculty and Students.

During the first two years in the program, students are required to take a number of courses to prepare them for research careers in physiology. These include a core course in molecular and cellular biology overseen by the Graduate School, and Program core courses in Comprehensive Physiology and Histophysiology. Additional requirements include courses in Ethics, Biostatistics, and Rigor & reproducibility. Beginning in the second year, a number of electives are also available emphasizing topics such as: neuropharmacology/neurobiology, cancer biology, bioinformatics, principles of pharmacology, advanced topics in molecular biology, cell and molecular signaling, and structural biology. Students are also required to participate in weekly Integrated Physiology Journal Clubs and Seminar Series throughout their time in the program.

The PhD program in Integrated Physiology trains graduate students to become proficient and successful investigators who are able to:

Demonstrate a basic knowledge of central concepts in the biomedical sciences.

Understand the current concepts in Integrated Physiology.

Read and critically evaluate the scientific literature relevant to physiology, in specific, and the basic and clinical biomedical sciences, in general.

Formulate hypotheses based on current concepts in the field and design, conduct, and interpret their own research projects.

Present research results in peer-reviewed publications and in a doctoral dissertation.

Communicate research results effectively through oral presentations at scientific seminars, conferences, and other venues.

Understand the basis of writing and submitting competitive applications for research funding.

Be competent in self-evaluation of acquired skills and understand how these skills may be perceived by external peers.

Develop a mature and meaningful Personal Development Plan (PDP) that will facilitate attainment of career objectives.

**Courses**

**BMSC 7806 - Core I: Foundations in Biomedical Sciences (6 Credits)**  
Course will focus on the fundamental principles of biomedical sciences. Lectures and recitations/discussions will primarily address the basics of molecular biology, biochemistry, genetics, cell biology and energetic principles. Course is typically limited to ORE biomedical science PhD. Previously offered as IDPT 7806  
Grading Basis: Letter Grade  
Repeatable. Max Credits: 6.  
Typically Offered: Fall.

**BMSC 7810 - Core Topics in Biomedical Science (2 Credits)**  
Sections focus on different core topics in biomedical science, and will address subject areas such as protein structure and function, neurobiology, embryology, stem cell research, and cancer biology. Students can enroll in multiple Core Topic Courses topics in one semester. Previously offered as IDPT 7810.  
Grading Basis: Letter Grade  
Repeatable. Max Credits: 20.  
AMC-PHD PhD Students only  
Typically Offered: Fall.

**CANB 7620 - Histophysiology (3 Credits)**  
Discussions of cell interactions, tissue physiology, and renewal based upon the histologic cell types and structures present. Where pertinent, pathologic alterations will be introduced to facilitate identification of the important normal functions/structures.  
Grading Basis: Letter Grade  
A-GRAD Restricted to graduate students only.  
Typically Offered: Spring.

IPHY 7650 - Research in Integrated Physiology (1-10 Credits)  
Research work in Integrated Physiology. Prerequisite: Consent of Instructor.

Grading Basis: Letter Grade with IP

Repeatable. Max Credits: 99.

A-GRAD Restricted to graduate students only.

Typically Offered: Fall, Spring, Summer.

IPHY 7652 - Special Topics in Integrated Physiology (1-3 Credits)

This course provides instruction in a specialized area of Integrated Physiology. Course content and the extent of the course varies from year to year. Prerequisite: Enrollment in PhD Program in Graduate School.

Grading Basis: Letter Grade

Repeatable. Max Credits: 3.

A-GRAD Restricted to graduate students only.

Typically Offered: Fall, Spring, Summer.

IPHY 8990 - Doctoral Thesis (1-10 Credits)

Doctoral thesis work in physiology.

Grading Basis: Letter Grade with IP

Repeatable. Max Credits: 99.

A-GRAD Restricted to graduate students only.

Additional Information: Report as Full Time.

Typically Offered: Fall, Spring, Summer.

## Policies

Please refer to the Graduate School Policies page (<http://catalog.ucdenver.edu/cu-anschutz/schools-colleges-programs/graduate-school/#policiestext>).

## Contact Us

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