

# INTEGRATIVE PHYSIOLOGY (IPHY)

## Courses

### IPHY 1020 (1) Introduction to Integrative Physiology

Introduces students to Integrative Physiology. Provides an overview of the major and how it differs from other biology programs; how to get involved in clubs, research, and/or internship opportunities; strategies for succeeding in IPHY courses; and career options. This is a first-year colloquium course specifically designed for freshman and other students exploring their educational and career opportunities.

### IPHY 1030 (1-2) Introduction to the Health Professions

Introduces students to careers in healthcare. This exploratory course is designed to expose students to the wide spectrum of healthcare occupations available and the knowledge of basic requirements and personal attributes needed to enter such career fields. Students will discover potential careers that match their skills and interests. Other topics include locations and areas healthcare professionals practice, including the lesser-known areas, as well as cultural and economic factors impacting health equity and access. This course is designed for first-year and second-year students.

### IPHY 1040 (1) Medical Professional Speaker Series

Fall semester only, meets one time per week. For students enrolled in Health Professions Residential Academic Program (HPRAP). Introduction to careers by working professionals from a variety of medical fields.

**Grading Basis:** Pass/Fail

### IPHY 1111 (2) Analysis of Human Movement with Smart-Phone Technology

Learn how to measure and analyze human movement using a smart-phone application. After being provided with some background information on human physiology, students will learn how to acquire, process, and analyze signals detected by the app. Students will be required to participate in a group project that they present in poster format to their peers.

**Requisites:** Restricted to students with 0-56 credits (Freshmen or Sophomore) only.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab

### IPHY 1131 (2) Using model organisms to study human disease: hands-on research

Provides a hands-on laboratory research experience, including undertaking science scholarship, designing and performing experiments, and analysis of quantitative data. Students will also be exposed to basic concepts in genetics and molecular biology, as well as the rationale for current experimental approaches for understanding human disease.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

### IPHY 1181 (2) Biological Probiotic/Drug Discovery Through Hands-on Screens

Provides introduction to research and laboratory experience. Students will work in teams to screen novel mycobacterial strains for use as probiotics or immunoregulatory/anti-inflammatory drugs using THP-1 cells, a human monocytic cell line. Topics covered include the hygiene or "Old Friends" hypothesis, the human microbiome, approaches to screening for new probiotics of therapeutics and statistical analysis of the data.

**Equivalent - Duplicate Degree Credit Not Granted:** MCDB 1181

**Grading Basis:** Letter Grade

### IPHY 1211 (2)

#### Using Sensor Technology to Study the Effects of Light on Human Health

Introduces you the basics of photobiology, measurement of light (including a discussion of human-centric vs. radiometric units for quantifying light exposure), and light effects on human physiology and long-term health. You will also be taught how to program light sensors, extract raw data, process, analyze and visualize it (incl. basic statistics in R).

**Grading Basis:** Letter Grade

### IPHY 1600 (3) Basic Human Anatomy and Physiology For Non-Majors

Focuses on basic knowledge of human body structures and functions. Topics include an orientation to the human body, basic chemistry and cell structure, the integumentary, skeletal, muscular, nervous, endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems. Integrative Physiology (IPHY) majors should take IPHY 3410 and 3430 to fulfill the anatomy and physiology degree requirements.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

### IPHY 1950 (3) Introduction to Scientific Writing in Integrative Physiology

Gives students practical tools that they will need as majors in Integrative Physiology or other sciences: skills in finding, reading, and using professional scientific publications; understanding of the formats required by various scientific documents; practice in writing about science for different purposes and audiences; and tools for analyzing and developing their own writing processes.

**Requisites:** Restricted to students with 0-86 credits (Freshmen, Sophomore or Juniors) only.

**Additional Information:** Arts Sci Core Curr: Written Communication

Arts Sci Gen Ed: Written Communication-Lower

MAPS Course: English

### IPHY 2010 (1-3) Seminar in Integrative Physiology

Introduces a small group of lower-division students to current research topics in integrative physiology. Emphasizes relevant applications to real-world situations.

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

### IPHY 2030 (2) Preparing for a Career in the Health Professions

This course is designed to help students learn the basic requirements and personal attributes needed to enter the healthcare professions, while building the primary elements of their application to health professional schools. Students will explore the ways in which they can gain shadowing, volunteering, and other clinical experiences that both fit their career path and reflect their personal goals and values. Students will also spend time working on one of the biggest components of their application - their personal statement. This course is specifically designed for sophomores, juniors, and seniors who are new to navigating admissions processes.

**Recommended:** Prerequisite IPHY 1030.

**IPHY 2400 (2) Introduction to Medical Terminology for Future Health Professionals**

Introduces medical terminology used within the health professions. Word roots, prefixes and suffixes used in medical records for major body systems will be examined and explained. The structure and functions of the major systems will be defined and described.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 2420 (3) Introduction to Nutrition**

Focuses on the basic anatomy, physiology, and chemistry of nutrition. Topics include weight management, the role of diet and lifestyle in disease prevention, specific nutrient deficiencies and toxicities, nutrition standards and guidelines, sports nutrition recommendations, agricultural practices, and food policy issues.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 3400

**Additional Information:** Arts Sci Core Curr: Natural Science Non-Sequence  
Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 2692 (3) Foundations in Public Health**

Get a comprehensive overview of public health as well as an in-depth introduction to specific public health-related topics. Beginning with a historical overview, students will explore major public health concepts such as the basic principles of epidemiology, the biomedical basis of disease, social and behavioral determinants of health, and systems thinking. Learn about the concepts of measuring and evaluating the health of populations, principles of communicable and non-communicable diseases, environmental and occupational health, the economics of health, and the role of public health workers in society.

**Equivalent - Duplicate Degree Credit Not Granted:** GEOG 2692 and PBHL 2692

**Additional Information:** Arts Sci Gen Ed: Distribution-Social Sciences

**IPHY 2910 (1-6) Practicum in Integrative Physiology**

Offers lower-division students practical experience in laboratory, clinical, or field settings with direct supervision. Students can earn 1 credit for every 45 hours of intern work.

**Repeatable:** Repeatable for up to 6.00 total credit hours.

**Requisites:** Restricted to students with 0-56 credits (Freshmen or Sophomore) only.

**IPHY 3010 (1-2) Teaching in Integrative Physiology**

Provides an opportunity for students to assist in specific lecture, recitation, or laboratory sections under direct faculty supervision. Students can earn 1 credit for 30-49 hours of class contact time or 2 credits for 50+ hours.

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisite Students must have earned B- or higher in the course they are assisting.

**IPHY 3020 (1) Next Steps: Preparing for Life After Graduation**

Helps upper-division students prepare for what comes after graduation. Topics include exploring careers; how to write a resume or CV; interviewing tips; how to build your portfolio; asking for letters of recommendations. This course is specifically designed for juniors starting to prepare for the next stage post-graduation.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 3020 and MCDB 3020

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Grading Basis:** Pass/Fail

**IPHY 3280 (4) Intro to Data Science and Biostatistics**

Builds a foundation for modern data analysis and experimental design in the context of human physiology, health and disease. An intuitive understanding of probability, statistical methods, test outcomes and data relationships are emphasized over rigorous mathematical proofs. Foundational analytical skills using R and R Studio are developed using real and simulated data.

**Additional Information:** Arts Sci Gen Ed: Quantitative Reasoning Math

**IPHY 3410 (3) Human Anatomy**

Explores the cells, tissues, and organs that compose the different anatomical systems including integumentary, skeletal, muscular, digestive, respiratory, cardiovascular, lymphatic, nervous, urinary and reproductive. All registration restrictions will be strictly enforced by the department.

**Requisites:** Requires prerequisite 1-semester biology lecture of EBIO 1210 or MCDB 1150 or CHEN 2810 (minimum grade C-).

**Recommended:** Prerequisite EBIO 1220.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 3415 (2) Human Anatomy Laboratory**

Introduces structures of the human anatomical systems using human cadavers and animal tissue. This laboratory is meant to complement IPHY 3410. All registration restrictions will be strictly enforced by the department.

**Requisites:** Requires prerequisite or corequisite of IPHY 3410 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 3430 (4) Human Physiology**

Introduces the physiology of the endocrine, nervous, muscular, cardiovascular, respiratory, urinary, digestive, reproductive and immune systems. Each system will be integrated into the larger contexts of homeostasis and adaptation during pathology and challenges. Students must enroll in lecture and recitation sections. All registration restrictions will be strictly enforced by the department. Students can be co-enrolled in CHEM 1133/1134 or IPHY 3435.

**Requisites:** Requires prerequisite courses of IPHY 3410 and prerequisite or corequisite of CHEM 1133 and 1134 (all minimum grade C-).

**Recommended:** Prerequisite IPHY 3415.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 3435 (2) Physiology Lab**

Introduces laboratory experience in selected aspects of human physiology with a focus on applying the scientific method in experimentation. This laboratory is meant to complement IPHY 3430. Students should take IPHY 3435 or IPHY 3437 to fulfill degree requirements. All registration restrictions will be strictly enforced by the department.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 3437

**Requisites:** Requires prerequisite course of IPHY 3280 or EBIO 1010 or MATH 2510 or PSYC 2111 or SOCY 2061, and prerequisite or corequisite course of IPHY 3430 (all minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 3437 (2) Virtual Human Physiology Laboratory**

Introduces online laboratory experiences for select aspects of human physiology using laboratory simulations. This online laboratory is meant to complement IPHY 3430. As an online course, this lab may not fulfill prerequisites for post-baccalaureate, graduate, or other allied health programs. Please consult with your Biology advisor before enrollment. Students should take IPHY 3435 or IPHY 3437 to fulfill degree requirements. All registration restrictions will be strictly enforced by the department.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 3435

**Requisites:** Prerequisite or corequisite of IPHY 3430 and prerequisite statistics course of IPHY 3280 or EBIO 1010 or MATH 2510 or PSYC 2111 or SOCY 2061 (all minimum grade C-). All registration restrictions will be strictly enforced by the department.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 3440 (3) Clinical Nutrition**

Exploration of clinical nutrition concepts from a health care provider perspective. Examines how and why diseases develop and what nutritional therapy and intervention is appropriate for disease resolution. All registration restrictions will be strictly enforced by the department.

**Requisites:** Requires prerequisite of IPHY 2420 (minimum grade C-). Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) majors only.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 3490 (3) Introduction to Epidemiology**

Examines the history and uses of epidemiology, measures of disease frequency and occurrence, association and causality, analytic epidemiology, evidence-based screening and outbreak investigations.

**Recommended:** Prerequisite Statistics course (IPHY 3280 or EBIO 1010 or MATH 2510 or PSYC 2111 or SOCY 2061).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 3590 (3) Health and Function over the Adult Lifespan**

Examines topics in the field of biomedical aging in the context of public health including lifespan, changing demographics of aging, health span, genetics of aging; physiology of aging (changes in function with age; biological mechanisms of aging); clinical disorders of aging (aging and chronic diseases; clinical syndromes in geriatric medicine); lifestyle and pharmacological strategies for preserving health and function with aging.

**Requisites:** Requires prerequisite courses of Human Physiology (IPHY 3430) and a statistics course (IPHY 3280, EBIO 1010, MATH 2510, PSYC 2111, or SOCY 2061).

**IPHY 3700 (3) Scientific Writing in Integrative Physiology**

Takes a process-based approach to writing. Assignments and classroom experiences emphasize critical thinking, using scientific evidence and reasoning to construct original arguments, and applying conventions and problem-solving skills to craft successful documents.

**Requisites:** Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

**Recommended:** Prerequisite Statistics course (IPHY 3280 or EBIO 1010 or MATH 2510 or PSYC 2111 or SOCY 2061).

**Additional Information:** Arts Sci Core Curr: Written Communication  
Arts Sci Gen Ed: Written Communication-Upper

**IPHY 4010 (1-3) Seminar in Integrative Physiology**

Introduces a small group of students to current research topics in integrative physiology, evaluation of current research and discussion of critical issues.

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisite Statistics course (IPHY 3280 or EBIO 1010 or MATH 2510 or PSYC 2111 or SOCY 2061).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4040 (3) History of Medicine**

Explores the history of western European medicine from the Middle Ages to the 19th century with a focus on the influence of social events and how these shaped the process and evolution of medicine. Projects explore topics of student interest that might include pharmacology, pathology, mental illness, optometry, dentistry, women in medicine, and the influence of war on medical practices. This is a three-week Education Abroad Global Seminar.

**Requisites:** Prerequisite IPHY 3410 (minimum grade C-)

**IPHY 4041 (3) Global Health and Disease**

This course will provide a comprehensive study of community health and common diseases with a specific geographical case study that will vary. Students will have the opportunity to learn about these topics through observations, discussions, visiting local clinics, and hospitals, and interaction with local communities. This is a three-week Education Abroad Global Seminar.

**Requisites:** Requires prerequisite course of IPHY 3410 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4060 (4) Cell Physiology**

Focuses on the molecular machines and cellular sub-compartments that allow cells to renew, replicate, and function in the context of multicellular organisms. Students in lecture section 010 must also enroll in a lab section. The online section of the course may not fulfill prerequisites for post-baccalaureate, graduate, or other allied health programs. Please consult with your Biology advisor before enrollment.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5060

**Requisites:** Requires prerequisite course of IPHY 3430 and IPHY 3435 or IPHY 3437 (all minimum grade C-). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4200 (3) Physiological Genetics and Genomics**

Covers fundamental concepts in molecular genetics/genomics with physiological applications. Topics include structure and function of nucleic acids, genome structure, genetic and genomic research tools, methods for identifying disease-causing mutations, regulation of gene expression, pharmacogenetics, gene therapy and ethical issues in modern genomics. First course of a 3-course series recommended for IBG students. Includes a recitation section.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5200

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4300 (3) Pathophysiology of Disease**

Uses case studies to explore various disease states of the organ systems within the body and the underlying mechanisms that contribute to the manifestations of these diseases. Additionally, students will examine the importance of epidemiology in the understanding of disease as well as discuss infectious disease, and the role of genetics in congenital defects and cancer. All registration restrictions will be strictly enforced by the department.

**Requisites:** Prerequisite of IPHY 3410 and IPHY 3430 (minimum grade C-).

**Grading Basis:** Letter Grade

**IPHY 4420 (3) Nutrition and Human Performance**

Examines nutrient use during exercise and the nutrient needs of athletes and active individuals, including strategies to improve physical performance and recovery through dietary manipulations and dietary supplements. All registration restrictions will be strictly enforced by the department.

**Requisites:** Prerequisite of IPHY 2420 (minimum grade C-). Restricted to Integrative Physiology (IPHY) majors only.

**IPHY 4440 (4) Endocrinology**

Introduces mammalian endocrine system. Provides a thorough analysis of chemical communication by hormones and related bioregulators with emphasis on the major endocrine systems such as the thyroid, gonad, pituitary and the brain. All registration restrictions will be strictly enforced by the department.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5440

**Requisites:** Requires prerequisite courses of IPHY 3430 and IPHY 3435 or IPHY 3437 (minimum grade C-). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4470 (3) Biology of Human Reproduction**

Anatomy and physiology of human reproduction, including gender determination, embryology, puberty, menstrual cycle, pregnancy, lactation, menopause, sexual behavior, sexual abnormalities and contraception. Open to all majors.

**Requisites:** Prerequisite of general biology (lecture + lab).

**Recommended:** Prerequisite IPHY 3430 and IPHY 4440.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4480 (3) Comparative Reproduction**

Focuses on comparative anatomy and physiology of reproductive system and the evolution of reproductive behavior in vertebrates and invertebrates. Topics include courtship, mating, fertilization, estrous and menstrual cycles and environmental control of seasonal reproduction.

**Requisites:** Prerequisite of general biology (lecture + lab).

**Recommended:** Prerequisite IPHY 3430.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4490 (3) Case Studies in Public Health**

Explores case studies in public health in how they have influenced our approach to disease outbreaks and disease resolution. Examines famous case studies in infectious disease, zoonoses and non-infectious diseases, including environmental and occupational exposure to see how they have changed our understanding of disease and responses by health and medical personnel. Examines special populations within public health, as well as discuss modern public health challenges.

**Requisites:** Prerequisite of IPHY 3490 (minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4540 (5) Biomechanics**

Applies the principles of physics and physiology to analyze the movement of humans and other animals. Assesses the mechanical properties of muscles, tendons, ligaments and bones. Quantitatively analyzes forces, torque, mechanical energy, power impulses and momentum associated with human movement. Students enroll in a lab, and the enrolled lab will have a designated recitation and lecture attached. All registration restrictions will be strictly enforced by the department.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5540

**Requisites:** Requires prerequisite courses of IPHY 3430 and physics (PHYS 1110 or PHYS 2010) (all minimum grade C-). Restricted to Integrative Physiology (IPHY), Neuroscience (NRSC), or College of Engineering majors only.

**Recommended:** Prerequisites IPHY 3415 and calculus (MATH 1300 or MATH 1310 or APPM 1350) and statistics (IPHY 3280 or EBIO 1010 or MATH 2510 or PSYC 2111 or SOCY 2061).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4580 (3) Sleep Physiology**

Describes the physiology, neurobiology, and functions of sleep and circadian rhythms; explains the impact of sleep and circadian rhythms, as well as sleep and circadian disruptions and disorders on immune, endocrine, thermoregulatory, cardiovascular, respiratory, and neural systems; examines changes in sleep and circadian rhythms across the life span. The integrative nature of sleep and circadian rhythms in normal physiological and cognitive functions and their importance in health and disease processes will be emphasized. All registration restrictions will be strictly enforced by the department.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5580

**Requisites:** Requires prerequisite course of IPHY 3430 (minimum grade C-). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

**Recommended:** Prerequisites Statistics course (IPHY 3280 or EBIO 1010 or MATH 2510 or PSYC 2111 or SOCY 2061).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4600 (3) Immunology**

Studies the immune system, a multi-cellular system that functions to protect us from disease. Introduces concepts associated with the development and function of individual cells of the immune system (T-cells, B-cells, neutrophils, dendritic cells, macrophages), as well as their integrative roles in physiology and host defense. This course requires a conceptual understanding of the material and emphasizes problem-solving skills through case studies. All registration restrictions will be strictly enforced by the department.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5600

**Requisites:** Requires prerequisite course of IPHY 3430 (minimum grade C-). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

**Recommended:** Prerequisite or corequisite IPHY 4060.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences



**IPHY 4650 (5) Exercise Physiology**

Examines physiological and biochemical adjustments that occur in the body with acute and chronic exercise. Topics center on physiological mechanisms pertaining to metabolic, cardiovascular, and hormonal alterations, the role of exercise in health and disease, soreness and fatigue, immune function, as well as exercise during varied environmental conditions. All registration restrictions will be strictly enforced by the department.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5650

**Requisites:** Requires prerequisite course of IPHY 3430 and IPHY 3435 or IPHY 3437 (all minimum grade C-). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4720 (4) Neurophysiology**

Explores the function of the nervous system, including how the properties of neurons influence nervous system activity, how the nervous system controls the activity of muscles and how the sensory effects of muscle activity influence the function of the nervous system. All registration restrictions will be strictly enforced by the department.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5720

**Requisites:** Requires prerequisite courses of IPHY 3430 and IPHY 3435 or IPHY 3437 (all minimum grade C-). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**IPHY 4780 (3) Sleep, Circadian Rhythms, and Health**

Examines the history of the fields of sleep and circadian rhythms; lifespan development of sleep and rhythms; observational, physiological, and clinical measures of sleep; screening for sleep and circadian disorders; associations between poor sleep and circadian misalignment and health; and evidenced-based sleep and circadian interventions/preventions in healthy and clinical samples. Dept. enforced requisite: one year of biology (lecture and lab).

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5780

**IPHY 4800 (3) Molecular Evolution: How Natural Selection has Shaped the Molecules of Life**

This course explores how Darwin's idea has shaped the structures of DNA, RNA and proteins across the long history of life on earth. Natural selection driving the evolution these macromolecules and subsequent developmental pathways will be fully appreciated as the process that ultimately produced the amazing variety of species on this planet. Looking ahead, our recent efforts to harness the power of evolution in the test tube to develop new therapies will be covered.

**Requisites:** Requires prerequisite courses of MCDB 3135 and MCDB 3145 (minimum grade C-).

**IPHY 4850 (1) Honors Thesis Seminar**

The course is specifically designed for students who are enrolled in the IPHY Honors program and have a faculty mentor. The course follows a workshop-based approach and aims to guide students through the various stages of writing and defending a thesis. It also provides an opportunity to share and receive feedback on works in progress. Throughout the course, students will have the chance to explore the scientific writing format, improve their writing process, and effectively communicate about science. Additionally, student will have the opportunity to practice a thesis defense talk.

**Recommended:** Prerequisite IPHY 3700; and IPHY 4870 (taken concurrently).

**IPHY 4860 (1-8) Independent Study: Undergraduate**

An opportunity for upper-division students to earn academic credit for working under the individual direction of a faculty member. Consult with faculty mentor and undergraduate coordinator for approval. Department enforced prerequisites: Cumulative GPA of 2.0 and completion of at least one upper-division IPHY course. Students can earn 1 credit for every 25 hours worked.

**Repeatable:** Repeatable for up to 8.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**IPHY 4870 (1-6) Honors Thesis**

An opportunity for students enrolled in the IPHY Honors program to earn academic credit for working on their thesis. Students can earn 1 credit for every 25 hours worked.

**Repeatable:** Repeatable for up to 6.00 total credit hours.

**Recommended:** Prerequisites IPHY 3700; and IPHY 4850 (taken concurrently).

**Additional Information:** Arts Sciences Honors Course

**IPHY 4880 (3) Advanced Data Analysis in Biomedical Research**

Provides advanced training on statistics and scientific reasoning in laboratory and clinical research. Conceptual foundations of classical and modern statistical techniques is reviewed. Multiple class projects consist of written reports on statistical analysis of data representative of the student's field of interest. The use of statistical packages, primarily R, is required.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5880

**Requisites:** Prerequisite: Statistics course (IPHY 3280 or EB10 1010 or MATH 2510 or PSYC 2111 or SOCY 2061 (minimum grade C)).

**Grading Basis:** Letter Grade

**IPHY 4900 (1-6) Public Health Practicum**

Offers practical experience in Public Health with direct supervision.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 4900 and MCDB 4900

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**IPHY 4930 (1-6) Internship**

Offers upper-division students practical experience in laboratory, clinical, and field settings with direct supervision. Students can earn 1 credit for every 45 hours of intern work. Consult with departmental internship coordinator for approval. Department enforced prerequisite: Cumulative GPA of 2.0 and completion of two upper-division IPHY courses.

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**IPHY 4940 (1-6) Application for Clinical Internship**

Provides upper-division students an opportunity for internship experience in a clinic and hospital setting with an established Affiliation Agreement with CU Boulder. Students can earn 1 credit for every 45 hours of intern work. Consult with departmental internship coordinator for approval. Department enforced prerequisite: Cumulative GPA of 2.0 and completion of two upper-division courses.

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**IPHY 4950 (1-6) Global Study Abroad Internship**

Provides an opportunity for students to combine international experiential learning and academic theory as a means to gain professional experience and to develop a new perspective on a career field. Contact the Study Abroad office (abroad@colorado.edu) for information on available opportunities and to find out how to enroll in this course.

**Repeatable:** Repeatable for up to 6.00 total credit hours.

**IPHY 5060 (4) Cell Physiology**

Focuses on the molecular machines and cellular sub-compartments that allow cells to renew, replicate, and function in the context of multicellular organisms. Students must enroll in lecture and recitation sections.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4060

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 5100 (2) Colloquium in Integrative Physiology**

**Repeatable:** Repeatable for up to 6.00 total credit hours.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 5200 (3) Physiological Genetics and Genomics**

Covers fundamental concepts in molecular genetics/genomics with physiological applications. Topics include structure and function of nucleic acids, genome structure, genetic and genomic research tools, methods for identifying disease-causing mutations, regulation of gene expression, pharmacogenetics, gene therapy and ethical issues in modern genomics. First course of a 3-course series recommended for IBG students. Includes a recitation section.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4200 and PSYC 5200

**Requisites:** Restricted to Integrative Physiology (IPHY or C-IPHY) or Psychology (PSYC) graduate students only.

**IPHY 5300 (3) Statistical Genetics for Complex Traits**

Focuses on the methods of mapping complex disease genes in both population and family-based samples. Topics include both linkage and association analyses of qualitative and quantitative phenotypes.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 5440 (4) Endocrinology**

Introduces mammalian endocrine system. Provides a thorough analysis of chemical communication by hormones and related bioregulators with emphasis on the major endocrine systems such as the thyroid, gonad, pituitary and the brain. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab).

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4440

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 5540 (5) Biomechanics**

Applies the principles of physics and physiology to analyze the movement of humans and other animals. Assesses the mechanical properties of muscles, tendons, ligaments and bones. Quantitatively analyzes forces, torque, mechanical energy, power impulses and momentum associated with human movement.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4540

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**Recommended:** Prerequisite one semester of physiology and one semester of general physics (lecture + lab).

**IPHY 5580 (3) Sleep Physiology**

Describes the physiology, neurobiology, physiology and functions neurobiology of sleep and circadian rhythms; explains the impact of sleep, sleep deprivation, and circadian rhythms, as well as sleep and circadian disruptions and disorders on immune, endocrine, thermoregulatory, cardiovascular, respiratory, and neural systems; systems, as well as examines changes in sleep and circadian rhythms across the the life span. The integrative nature of sleep and circadian rhythms in normal physiological and cognitive functions and their importance in health and disease processes will be emphasized. Department enforced prerequisite: statistics equivalent.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4580

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 5600 (3) Immunology**

Studies the immune system, a multi-cellular system that functions to protect us from disease. Introduces concepts associated with the development and function of individual cells of the immune system (T-cells, B-cells, neutrophils, dendritic cells, macrophages), as well as their integrative roles in physiology and host defense.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4600

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**Recommended:** Prerequisites one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab); IPHY 3470.

**IPHY 5650 (5) Exercise Physiology**

Examines physiological and biochemical adjustments that occur in the body with acute and chronic exercise. Topics center on physiological mechanisms pertaining to metabolic, cardiovascular, and hormonal alterations, the role of exercise in health and disease, soreness and fatigue, immune function, as well as exercise during varied environmental conditions.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4650

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**Recommended:** Prerequisite one semester of physiology and one semester of physiology lab.

**IPHY 5720 (4) Neurophysiology**

Explores the function of the nervous system, including how the properties of neurons influence nervous system activity, how the nervous system controls the activity of muscles and how the sensory effects of muscle activity influence the function of the nervous system. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab), IPHY 2800 (or equivalent); IPHY 3410.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4720

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**Grading Basis:** Letter Grade

**IPHY 5740 (3) Theory of Motor Skill Learning**

Offers a critical analysis of motor learning theories, including Adam's closed loop theory, Schmidt's schema theory and the influence of contextual interference on learning and performance. Also covers feedback and practice organization. Projects and presentations required.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4740

**Requisites:** Restricted to Integrative Physiology (IPHY or C-IPHY) or Psychology (PSYC) graduate students only.

**IPHY 5780 (3) Sleep, Circadian Rhythms, and Health**

Examines the history of the fields of sleep and circadian rhythms; lifespan development of sleep and rhythms; observational, physiological, and clinical measures of sleep; screening for sleep and circadian disorders; associations between poor sleep and circadian misalignment and health; and evidenced-based sleep and circadian interventions/preventions in healthy and clinical samples. Dept. enforced requisite: one year of biology (lecture and lab); statistics course.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4780

**IPHY 5800 (4) Advanced Statistics and Research Methods in Integrative Physiology**

Introduces advanced statistical techniques important for analyzing data rising in biomedical research, including physiology. Statistical reasoning will be emphasized through problem solving and applications using statistical software packages.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**Recommended:** Prerequisite IPHY 2800.

**IPHY 5840 (1-6) Graduate Independent Study**

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 5880 (3) Advanced Data Analysis in Biomedical Research**

Provides advanced training on statistics and scientific reasoning in laboratory and clinical research. Conceptual foundations of classical and modern statistical techniques is reviewed. Multiple class projects consist of written reports on statistical analysis of data representative of the student's field of interest. The use of statistical packages, primarily R, is required.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 4880

**Requisites:** Requires prerequisite course of IPHY 5800 (minimum grade B).

**Grading Basis:** Letter Grade

**IPHY 5900 (3) Data Literacy in Biomedical Research**

Provides a platform to develop a deeper understanding of quantitative biomedical research, current trends, challenges, and limitations. The course complements graduate statistical training by introducing topics relevant to open science and data literacy, including reproducibility, data privacy challenges, and the importance of good data management. Challenges in advanced statistical data evaluation and analysis in biomedical research settings will be discussed.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**Recommended:** Prerequisite IPHY 5800.

**Grading Basis:** Letter Grade

**IPHY 6010 (1-3) Seminar**

Presents special topics in integrative physiology.

**Repeatable:** Repeatable for up to 15.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 6660 (3) Locomotion Energetics and Biomechanics**

Critiques and discusses both classic and cutting edge scientific research in the area of terrestrial locomotion.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**Recommended:** Prerequisites IPHY 4540 and IPHY 4650.

**IPHY 6680 (3) Matlab for Physiological and Biomechanical Research**

Introduces Matlab programming skills needed to write and modify programs for data acquisition and analysis, statistics, plotting, and simulation.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 6830 (3) Professional Skills for the Research Scientist**

Discusses grant and manuscript writing, scientific presentations, peer-review, setting up/directing a research laboratory, research ethics, mentoring and other professional skills.

**Requisites:** Restricted to Integrative Physiology (IPHY) doctoral students only.

**IPHY 6840 (1-3) Research Project**

Involves a scholarly investigation of a selected topic using literature and/or experimental techniques. Advisor required.

**Repeatable:** Repeatable for up to 3.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 6940 (1) Master's Candidate for Degree**

Registration intended for students preparing for a thesis defense, final examination, culminating activity, or completion of degree.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 6950 (1-6) Master's Thesis**

Must have 4 credit hours and may be repeated up to 6 total credits.

**Repeatable:** Repeatable for up to 6.00 total credit hours.

**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

**IPHY 8990 (1-10) Doctoral Dissertation**

All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School section.

**Requisites:** Restricted to Integrative Physiology (IPHY) doctoral students only.