INTEGRATIVE PHYSIOLOGY (IPHY)

Courses

IPHY 1950 (3) Introduction to Scientific Writing in Integrative Physiology
Provides an overview of writing skills and strategies, emphasizing those most important to the sciences, especially physiology. Focuses on fundamental skills, objective analysis, and scientific persuasion, with attention to clear organization and style, academic and scientific mechanics, and distinctions between audiences.
Requisites: Restricted to students with 0-86 credits (Freshmen, Sophomore or Juniors) only.
Additional Information: Arts Sci Core Curr: Written Communication
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.

IPHY 2400 (2) Introduction to Medical Terminology for Future Health Professionals
Provides an introduction to 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. Recommended for IPHY students and students interested in pursuing a career in the health professions. No prerequisites required.
Grading Basis: Letter Grade

IPHY 2420 (3) Nutrition for IPHY Majors
Focuses on the science of nutrition, reviewing 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. IPHY juniors or seniors are excluded from taking this course.
Equivalent - Duplicate Degree Credit Not Granted: IPHY 3400
Requisites: Restricted to non-IPHY majors or IPHY freshmen/sophomores (students with 0-56 credits) only.
Additional Information: Arts Sci Core Curr: Natural Science Non-Sequence

IPHY 2450 (1) Perspectives in Health and Medicine
Designed to increase awareness of issues that surround international and U.S. health care. Provides broad overview of topics relevant to 21st century medical practice. Includes guest lectures by faculty and practitioners from Denver Metro region, followed by opportunities to integrate new concepts using small group discussion and writing. Topics change each semester and may include: global development and health; socio-cultural issues in health care; health disparities; applied bioethics; health care system reform; narrative medicine.
Requisites: Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.
Grading Basis: Pass/Fail

IPHY 2750 (3) Introduction to Exercise Psychology
Focuses on how psychological factors influence exercise and motor performance in both clinical and sport settings. Major topics include motivation, arousal, stress, imagery, self-confidence, concentration and burnout. Principles of psychological skills training are also discussed.

IPHY 2800 (4) Introduction to Statistics
Examines the application of statistics to research relevant to integrative physiology. Includes instruction and hands-on experience with related computer programs and interpretation of the results of their use.
Requisites: Restricted to Integrative Physiology (IPHY) majors only.
Recommended: Prerequisite MATH 1300.

IPHY 2910 (1-6) Practicum in Integrative Physiology
Offers practical experience in organized situations with direct supervision.
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 to assist in teaching specific laboratory sections in IPHY under direct faculty supervision. Students must make arrangements with the faculty member responsible for the course in which they plan to assist.
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

IPHY 3060 (4) Cell Physiology
Lect. and lab. Introduces the biology of eukaryotic systems at molecular, cellular and systems levels of integration, emphasizing the complementarities of structure and function and physiological mechanisms of regulation at the cellular and molecular level. Department enforced prerequisite: one year of general biology (lecture + lab).
Requisites: Requires prerequisite course of IPHY 3430 or IPHY 3470 (minimum grade C). Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

IPHY 3400 (3) Nutrition for IPHY Majors
Focuses on the science of nutrition, reviewing the basic anatomy, physiology and chemistry of nutrition. Concepts will focus on what the body needs for proper nutrition, how they are obtained, absorbed and processed by the body. Studies will expand to include the following: diet types, nutrition during life stages (i.e. pregnancy), different disease states and real world applications.
Equivalent - Duplicate Degree Credit Not Granted: IPHY 2420
Requisites: Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree majors only.
Recommended: Prerequisite IPHY 3410.
Grading Basis: Letter Grade

IPHY 3410 (3) Introduction to Human Anatomy
Introduces the basics of human anatomy. Department enforced prerequisite: one year of general biology (lecture + lab).

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. Department enforced prerequisites: one year of general biology (lecture + lab) and corequisite: IPHY 3410.

IPHY 3430 (3) Introduction to Human Physiology
Introduces the physiology of the nervous, muscular, cardiovascular, respiratory, urinary, immune, endocrine, digestive and reproductive systems. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab).
Requisites: Requires prerequisite courses of CHEM 1133 and CHEM 1134 or CHEM 3321 and CHEM 3451 (all minimum grade C). Restricted to non-Integrative Physiology (IPHY) majors only.
Recommended: Prerequisites IPHY 3410 and IPHY 3415.
IPHY 3435 (2) Physiology Lab
Introduces laboratory experience in selected aspects of human and comparative physiology for students in pharmacy and allied health programs. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab); IPHY 2800 (or equivalent); IPHY 3410, IPHY 3415 and IPHY 3430 (prerequisites for majors; recommended courses for non-majors); IPHY 3430 (non-majors only).
Requisites: Requires prerequisite course of IPHY 3470 (minimum grade C).
Recommended: Corequisite IPHY 3480 (majors only).

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.
Requisites: Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree majors only.
Recommended: Prerequisite IPHY 2420.

IPHY 3450 (3) Comparative Animal Physiology
Introduces principles of animal physiology and responses to environmental change. Involves animals and/or animal tissues. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab).

IPHY 3460 (5) Comparative Vertebrate Anatomy
Introduces major components of the vertebrate body and how they are organized into a whole organism, emphasizing function, evolution, and diversity of these basic features. Laboratories involve dissection of representative groups and demonstrations. Involves animals and/or animal tissues. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab).

IPHY 3470 (3) Human Physiology 1
Focuses on scientific thinking, cell physiology, neurophysiology, endocrinology, immunology and musculoskeletal physiology. First semester of a two-semester sequence for IPHY and NRSC majors only. Department enforced prerequisites: IPHY 3410 and one year of general biology (lecture and lab) and one year of general chemistry (lecture and lab).
Requisites: Requires prerequisite courses of CHEM 1133 and CHEM 1134 or CHEM 3321 and CHEM 3451 (all minimum grade C). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

IPHY 3480 (3) Human Physiology 2
Focuses on the physiology of the respiratory, cardiovascular, urinary, digestive and reproductive systems. The second semester of a two-semester sequence for IPHY and NRSC majors. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab); IPHY 3410 and 3415.
Requisites: Requires prerequisite course of IPHY 3470 (minimum grade C-). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.
Recommended: Corequisite IPHY 3435.

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: Prerequisites IPHY 2800 and SOCY 2061 and PSYC 3101.

IPHY 3500 (2) Applied Clinical Research
Introduces fundamental concepts of clinical research to those interested in pursuing a career in medicine or medical research. In addition to lectures introducing students to research design, errors in research and basic biostatistics, there will be significant emphasis on participation in on-going medical research at Denver Health Medical Center and The Children's Hospital. This unique experience will provide students with first-hand exposure to all aspects of clinical research. Department enforced prerequisites: one year of general biology (lecture + lab).
Recommended: Prerequisite CHEM 3111 and premedical focus and/or previous research experience.

IPHY 3580 (3) Sleep, Circadian Rhythms and Health
Examines the history 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 evidence-based sleep and circadian interventions/preventions in healthy and clinical samples. Department enforced prerequisites: one year general biology plus labs, and one semester of statistics.

IPHY 3660 (3) Dynamics of Motor Learning
Focuses on information processing approaches and dynamical systems theory as explanations for human motor learning and the coordination of movement. Various topics are discussed from both perspectives including practice organization, attainment of elite performance, and the production of novel movements.

Additional Information: Arts Sci Core Curr: Natural Science Non-Sequence

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. Department enforced prerequisite: IPHY 2800 or equivalent.
Requisites: Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree or Neuroscience (NRSC) majors only.

Additional Information: Arts Sci Core Curr: Written Communication

IPHY 3800 (3) Forensic Biology
Introduces basic concepts of modern forensic science with emphasis on biological aspects such as forensic entomology, forensic botany, hair analysis, forensic anthropology, and forensic DNA analysis. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab).

IPHY 3810 (1) Forensic Biology Laboratory
Introduces basic laboratory techniques and procedures of modern forensic science with emphasis on biological aspects such as forensic entomology, forensic botany, hair analysis, forensic anthropology and forensic DNA analysis. Department enforced prerequisites: one year of general biology (lecture + lab) and one year of general chemistry (lecture + lab).
Recommended: Corequisite IPHY 3800.

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. Department enforced prerequisite: IPHY 2800 or equivalent.
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.
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.

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. 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 5440
Requisites: Requires prerequisite course of IPHY 3470 (minimum grade C). Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.

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 nonmajors. Department enforced prerequisites: one year of general biology (lecture + lab).
Recommended: Prerequisites IPHY 3470 and IPHY 3480 (majors) or IPHY 3430 or (non-majors) or IPHY 4440.

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.
Department enforced prerequisite: one year of general biology (lecture + lab).
Recommended: Prerequisite IPHY 3480 (majors) or IPHY 3430 (non-majors).

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: Requires prerequisite courses of IPHY 3490 (minimum grade D-).
Grading Basis: Letter Grade

IPHY 4540 (5) Biomechanics
Applies the principles of physics and physiology to the analysis of human movement. Quantitative analysis of the forces, torques, mechanical energy, power impulses and momentum associated with human movement. Mechanical properties of muscles, tendons, ligaments and bones. Department enforced prerequisites: PHYS 2010 or PHYS 1110 or IPHY 3410 and IPHY 2800.
Requisites: Requires prerequisite course of IPHY 3470 (minimum grade C). Restricted to Integrative Physiology (IPHY) or Neuroscience (NRSC) majors only.
Recommended: Prerequisites MATH 1300 or MATH 1310 or APPM 1350 and IPHY 3415.

IPHY 4580 (3) Sleep Physiology
Describes the physiology and neurobiology of sleep and impact of sleep, sleep deprivation, and sleep disorders on immune, endocrine, cardiovascular, respiratory, and neural systems, as well as examines changes in sleep across the life span. The integrative nature of sleep and circadian rhythms in normal
Requisites: Requires prerequisite course of IPHY 3470 (minimum grade C).

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. 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 5600
Requisites: Requires prerequisite course of IPHY 3470 (minimum grade C). Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY), Integrative Physiology Concurrent Degree or Neuroscience (NRSC) majors only.
Recommended: Prerequisite IPHY 3060.

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. Department enforced prerequisites: IPHY 2800 or equivalent and IPHY 3480. Department enforced corequisite: IPHY 3410.
Requisites: Requires prerequisite course of IPHY 3470 and 3480 (all minimum grade C-). Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree or Neuroscience (NRSC) majors only.

IPHY 4660 (3) Critical Thinking in Integrative Physiology
Covers specific integrative physiology topics in areas such as animal physiology, endothelial function, neurobiology, exercise immunology and exercise physiology. Department enforced prerequisite: 13-hours of IPHY coursework.
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree majors only.
**IPHY 4680 (3) Critical Thinking in Exercise Physiology**
Covers specific exercise physiology topics such as cellular cause of fatigue and muscle soreness, heart disease, regulation of blood flow, diabetes, aging, training adaptations, exercise at high altitude, ergogenic aids and excitation-contraction of muscle. Department enforced prerequisite: IPHY 4650.

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

**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. 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 5720
**Requisites:** Requires prerequisite course of IPHY 3470 (minimum grade C). Restricted to students with 57-180 credits (Junior or Senior) Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree or Neuroscience (NRSC) majors only.

**Grading Basis:** Letter Grade

**IPHY 4730 (3) Integrative Motor Control**
Investigates human motor control by integrating concepts from exercise physiology, biomechanics, and sport psychology. Applications are made to clinical and educational exercise contexts.

**Equivalent - Duplicate Degree Credit Not Granted:** IPHY 5730
**Recommended:** Prerequisites IPHY 3410 and IPHY 3470.

**IPHY 4740 (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 5740
**Requisites:** Restricted to students with 57-180 credits (Seniors or Juniors).

**IPHY 4850 (3) Honors Thesis Seminar**
To be taken during the final academic year prior to graduation. Consists of a lecture component on Honors thesis writing and defense, as well as a seminar component where Honors candidates present their thesis research in a practice defense talk.

**Recommended:** Prerequisite IPHY 3700, minimum 3.3 GPA and a declared IPHY major and approval by departmental honors committee.

**Grading Basis:** Pass/Fail

**IPHY 4860 (1-6) Independent Study: Undergraduate**
Students may register for more than one section per term.

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

**IPHY 4870 (1-3) Honors Thesis**
Department enforced prerequisites: IPHY 2800 and IPHY 3700.

**Additional Information:** Arts Sciences Honors Course

**IPHY 4890 (3) Community-Based Primary Health Care**
Introduces models of Community-Based Health Care (CBPHC), relevant research regarding the models and methods of implementation in rural low resource settings. This 3 week summer global seminar in Nicaragua also includes public health data collection in a rural area in conjunction with local health promoters. Provides students with practical skills in the implementation of CBPHC in rural low resource settings.

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

**Recommended:** Prerequisite GEOG 3692.

**Grading Basis:** Letter Grade

**IPHY 4930 (1-6) Internship**
Provides an opportunity for field/laboratory work in a variety of different settings. Consult with faculty for approval. Department enforced prerequisite: completion of at least two of the major core classes.

**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 an opportunity for clinical experience in a clinic or hospital setting with which the University has an established Affiliation Agreement. Consult with faculty for approval. Department enforced prerequisite: completion of two 3000-level 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 5010 (1) Graduate Student Research Forum**
Special topics spanning the broad scope of integrative physiology are covered in a seminar-style format. Presentations by current IPHY faculty are augmented by graduate student presentations of thesis and dissertation work.

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

**IPHY 5102 (2) Introduction to Physiology Genomics**
Covers recent developments in genomics: a body of revolutionary new approaches that deal with the analysis of all the DNA sequence in the cell. Relies on a genomics text and student presentation/discussion aided by a study guide.

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

**Recommended:** Prerequisite IPHY 5200.

**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 5262 (3) Application of Bioinformatics and Genomics
Explore public websites, databases, and bioinformatic tools that can be used for analysis of genomic data. These include NCBI Resources, genome databases, gene expression databases, tools for nucleotide and algorithms analyses and protein databases. Students develop a minor grant proposal that is required to incorporate use of some of the tools covered.

Requisites: Restricted to Integrative Physiology (IPHY or C-IPHY) or Psychology (PSYC) graduate students only.
Recommended: Prerequisite IPHY 5200 and IPHY 5102.

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 5550 (3) Exercise Biochemistry
Examines the underlying biochemical mechanisms that are responsible for the physiological adaptations to short- and long-term dynamic exercise including carbohydrate, fat, and protein metabolism. The interaction of key biochemical alterations as it relates to disease (diabetes, obesity, and aging) and exercise will be addressed.

Requisites: Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.
Recommended: Prerequisite IPHY 4650 and one year of general chemistry (lecture + lab).

IPHY 5580 (3) Sleep Physiology
Describes the physiology and neurobiology of sleep and impact of sleep, sleep deprivation, and sleep disorders on immune, endocrine, cardiovascular, respiratory, and neural systems, as well as examines changes in sleep across the life span. The integrative nature of sleep and circadian rhythms in normal

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 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 C-IPHY) graduate students only.

Grading Basis: Letter Grade

IPHY 5730 (3) Integrative Motor Control
Investigates human motor control by integrating concepts from exercise physiology, biomechanics, and sport psychology. Applications are made to clinical and educational exercise contexts.

Equivalent - Duplicate Degree Credit Not Granted: IPHY 4730
Recommended: Prerequisites IPHY 3410 and IPHY 3470.

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 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 C-IPHY) graduate students only.

IPHY 6010 (1-3) Seminar
Presents special topics in integrative physiology.
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

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

IPHY 6650 (3) Cellular Cardiovascular Physiology
Focuses on the cellular control of cardiac and smooth muscle contraction, at rest and in response to acute and chronic exercise. Addresses certain pathophysiological and physiological adaptive mechanisms.

Requisites: Restricted to Integrative Physiology (IPHY or C-IPHY) graduate students only.
Recommended: Prerequisite IPHY 4650.
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 C-IPHY) graduate students only.
**Recommended:** Prerequisites IPHY 4540 and IPHY 4650.

IPHY 6670 (2) Hypothesis Testing in Locomotion Biomechanics
Focuses on the scientific process including formulating and testing hypotheses in studies of locomotion. Students analyze primary articles to determine whether the studies tested hypotheses and to generate new hypotheses that logically follow from previous studies.
**Requisites:** Restricted to Integrative Physiology (IPHY) or Integrative Physiology Concurrent Degree (C-IPHY) graduate students only.

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 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 C-IPHY) graduate students only.

IPHY 6940 (1) Master’s Degree Candidate
**Requisites:** Restricted to Integrative Physiology (IPHY or C-IPHY) graduate students only.
**Grading Basis:** Pass/Fail

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 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.