HUMAN PHYSIOLOGY

Department Website: Human Physiology (https://www.gonzaga.edu/school-of-health-sciences/departments/human-physiology/)

The Bachelor of Science degree in Human Physiology provides a comprehensive examination of human body form and function from the molecular level to the whole organism. This examination begins with an introduction to fundamental physical and life sciences and is followed by in-depth study in all aspects of human anatomy, physiology, and function. This in-depth study includes human movement and biomechanics as well as applied physiology of exercise and physical activity, advanced systems physiology, and physiology of health and disease. Laboratory experiences are used to introduce students to the methods used in the scientific inquiry of human structure and function and culminate in conception and execution of a novel research project. The degree is unique within the University because it emphasizes the mechanisms of human function, adaptation, health and disease, as well as the fundamental process of science, and research methods in investigating human physiology. In addition to the University Core requirements, the Human Physiology degree requires a total of 68 credits for completion. Because several courses may double-count for both the University Core Curriculum and the Human Physiology degree, the total credits needed to complete the University Core and Human Physiology degree is 108 credits. This can be further reduced through careful selection of Core Designation (global studies, social justice, writing enriched) courses. Therefore, Human Physiology majors have a minimum of 20 additional elective credits to complete a minor and/or specific prerequisite courses for graduate or professional school.

Because prerequisites for admission to different graduate programs vary, students are advised to obtain the specific prerequisites from programs and schools of interest as early in their academic career as possible.

Human Physiology (BS) Major Program Requirements

Code	Title	Hours
Science Core		
BIOL 105 & 105L	Information Flow in Biological Systems and Information Flow in Biological Systems Lab	4
CHEM 101 & 101L	General Chemistry I and General Chemistry I Lab	4
CHEM 102 & 102L	General Chemistry II and General Chemistry II Lab	4
MATH 148	Survey of Calculus (or higher)	3
PHYS 111 & 111L	General Physics I and General Physics I Lab	5
PHYS 112 & 112L	General Physics II and General Physics II Lab	5
PSYC 101 or SOCI 101	General Psychology Introduction to Sociology	3
Lower Division		
HPHY 205	Experimental Design and Statistics	3
HPHY 210	Scientific Writing	3
HPHY 241 & 241L	Human Anatomy and Physiology and Human Anatomy and Physiology Lab	4
HPHY 242 & 242L	Human Anatomy and Physiology II and Human Anatomy and Physiology Lab II	4
HPHY 274	Musculoskeletal Dynamics and Physiology	3
Upper Division		
HPHY 375 & 375L	Biomechanics and Biomechanics Lab	4
HPHY 376 & 376L	Exercise Physiology and Exercise Physiology Lab	4
HPHY 441L	Guided Experimental Design	1
HPHY 442L	Guided Research	1
HPHY 499	Culminating Experience	1
HPHY 300-400 level electives [1]		12
Total Hours		**68**

[1] A maximum of three credits may be lower division science credits if approved by the department.

Courses

HPHY 190. Directed Study. (1-3 Credits)
May be repeated for credit.
Topic to be decided by faculty. Course may be repeated to total not more than 2 credits. By permission from department only. Fall, Spring, and Summer.

HPHY 205. Experimental Design and Statistics. (3 Credits)
Relationships among research, research design, measurement, and data analysis provide the context for an introduction to basic concepts of research design and data analysis. Students will learn how to interpret statistics in peer-reviewed research and how to apply statistical methods to analyze data and address research questions in the sciences. Fall.

HPHY 210. Scientific Writing. (3 Credits)
An introduction to the fundamentals of writing scientific reports and manuscripts of experimental research, with special emphasis on research in human physiology. Spring.
Prerequisites: HPHY 205 with a minimum grade of D

HPHY 241. Human Anatomy and Physiology. (3 Credits)
An introduction to the fundamentals of anatomical and physiological science, emphasizing basic cell processes as well as homeostasis and control. Basic cell processes include compartmentation of cells and tissues, bioenergetics, membrane dynamics, communication, integration, and homeostasis. Topics include cells, tissues, metabolism, the endocrine system, the nervous system, and muscle. Fall.
Prerequisites: CHEM 101 with a minimum grade of D and CHEM 101L with a minimum grade of D and BIOL 105 with a minimum grade of D
Corequisites: HPHY 241L

HPHY 241L. Human Anatomy and Physiology Lab. (1 Credit)
This laboratory covers physiology and both microscopic and gross anatomy of the skeletal system, muscular system, nervous system, and integumentary system. Fall.
Corequisites: HPHY 241
Course Fee: 150

HPHY 242. Human Anatomy and Physiology II. (3 Credits)
This course is a continuation of HPHY 241 emphasizing integration of function. Topics include the cardiovascular, respiratory, renal and immune systems as well as fluid, electrolyte, acid base balance. Spring.
Prerequisites: HPHY 241 with a minimum grade of D and HPHY 241L with a minimum grade of D
Corequisites: HPHY 242L

HPHY 242L. Human Anatomy and Physiology Lab II. (1 Credit)
This laboratory covers the anatomy and physiology of the cardiovascular, respiratory, digestive, urinary and reproductive systems as well as vision, hearing, and equilibrium. Spring.
Prerequisites: HPHY 241L with a minimum grade of D
Corequisites: HPHY 242
Course Fee: 150

HPHY 244. Nutrition and Metabolism. (3 Credits)
An introduction to the study of the role macro and micro nutrients including carbohydrates, fat, protein, vitamins, minerals, and water play in bioenergetics. Additional topics include the anatomy and physiology of digestion, absorption, and the microbiome. Spring.
Prerequisites: HPHY 241 with a minimum grade of D and HPHY 241L with a minimum grade of D

HPHY 274. Musculoskeletal Dynamics and Physiology. (3 Credits)
An introduction to the basic principles of kinesiology with emphasis on osteology, arthrology, and the mechanical interactions between the muscles and joints of the body. Spring.
Prerequisites: HPHY 205 with a minimum grade of D and (PHYS 101 with a minimum grade of D or PHYS 111 with a minimum grade of D) and (PHYS 101L with a minimum grade of D or PHYS 111L with a minimum grade of D) and HPHY 241 with a minimum grade of D and HPHY 241L with a minimum grade of D

HPHY 304. Practice in Lab Teaching. (1 Credit)
May be repeated for credit.
Students gain experience in assisting in teaching and directing human physiology laboratory sections. The student must have successful completion of the lab for which the student will be a teaching assistant. By permission from department only. May be repeated for different lab courses (e.g., HPHY 241L and HPHY 242L) with departmental permission to total not more than 2 credits. Fall, Spring, Summer.
Prerequisites: HPHY 242 with a minimum grade of D and HPHY 242L with a minimum grade of D

HPHY 375. Biomechanics. (3 Credits)
An introduction to the physical laws and mechanical aspects governing human motion which covers analysis of internal and external forces acting on the human body and the effects of these forces. Topics include kinematics and kinetics of human motion, function of the musculoskeletal system, and mechanical analysis of movement. Fall.
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: HPHY 375L

HPHY 375L. Biomechanics Lab. (1 Credit)
An introduction to techniques and experimental methods used in the study of human motion.
Corequisites: HPHY 375
Course Fee: 150

HPHY 376. Exercise Physiology. (3 Credits)
A course dealing with the nature and function of neuromuscular activity, circulation, metabolism, respiration and acid-base balance as they relate to exercise and performance. Fall. Prerequisite(s): (HPHY 205 and HPHY 210 and HPHY 242 and HPHY 242L and MATH 148 or higher and PHYS 102 and PHYS 102L)
Prerequisites: Prerequisites exist. Refer to Zagweb.
Corequisites: HPHY 376L

HPHY 376L. Exercise Physiology Lab. (1 Credit)
Laboratory study and techniques dealing with the evaluation of physiological capacities involved in rest, exercise, neuromuscular interactions, metabolism, respiration, and circulation. Fall.
Corequisites: HPHY 376
Course Fee: 150

HPHY 390. Directed Study. (1-2 Credits)
May be repeated for credit.
Topic to be decided by faculty. Course may be repeated to total not more than 2 credits. By permission from department only. Fall, Spring, Summer.

HPHY 401. Assessment of Health and Function. (3 Credits)
The course covers the purposes, methods, and guidelines related to assessment of health, fitness, and function. Fall or Spring on need.
Prerequisites: HPHY 376 with a minimum grade of D and HPHY 376L with a minimum grade of D
Corequisites: HPHY 401L

HPHY 401L. Assessment of Health and Function Lab. (1 Credit)
Students will develop skill in administering selected field and laboratory tests for assessing different components of health, fitness, and function. Fall or Spring on need.
Corequisites: HPHY 401
Course Fee: 150

HPHY 402. Clinical Exercise Physiology. (3 Credits)
Assessing and treating individuals with chronic diseases and disabilities, as well as other special populations. Content will include physiology and pathophysiology, exercise prescription, clinical applications, and current research related to a variety of diseases and conditions. Fall or Spring on need.
Prerequisites: HPHY 376 with a minimum grade of D and HPHY 376L with a minimum grade of D

HPHY 422. Cardiovascular Physiology. (3 Credits)
This course is designed for upper division students and will expand on the core cardiovascular concepts covered in HPHY 242. The course is designed to help students develop a detailed understanding of the physiology and regulation of the cardiovascular system. The course will cover concepts of myocardial function, peripheral vascular function and the integration and regulation of these two components of the cardiovascular system. Fall or Spring on need.
Prerequisites: HPHY 376 with a minimum grade of D

HPHY 432. CIS:. (3 Credits)
The Core Integration Seminar (CIS) engages the Year Four Question: "Imagining the possible: What is our role in the world?" by offering students a culminating seminar experience in which students integrate the principles of Jesuit education, prior components of the Core, and their disciplinary expertise. Each section of the course will focus on a problem or issue raised by the contemporary world that encourages integration, collaboration, and problem solving. The topic for each section of the course will be proposed and developed by each faculty member in a way that clearly connects to the Jesuit Mission, to multiple disciplinary perspectives, and to our students' future role in the world.
Prerequisites: Prerequisites exist. Refer to Zagweb.

HPHY 441L. Guided Experimental Design. (1 Credit)
Laboratory research in the study of physiology or a related sub-discipline such as biomechanics or biomedical engineering. Students work in groups with a faculty advisor (course instructor) in proposing, researching and designing an experiment. Students will author a research proposal and conduct pilot work. Spring.
Prerequisites: (HPHY 375 with a minimum grade of D and HPHY 375L with a minimum grade of D) and (HPHY 376 with a minimum grade of D and HPHY 376L with a minimum grade of D)
Course Fee: 150
Enrollment is limited to students with a major in Human Physiology.

HPHY 442L. Guided Research. (1 Credit)
Laboratory research in the study of physiology or a related sub-discipline such as biomechanics or biomedical engineering. Students work in groups with a faculty advisor (course instructor) in conducting, analyzing, and presenting their research. Fall.
Prerequisites: HPHY 441L with a minimum grade of D
Course Fee: 150
Enrollment is limited to students with a major in Human Physiology.

HPHY 451. Systems Neurophysiology. (3 Credits)
The course is an advanced examination of the cellular and physiological properties of neurons, neural communication / transmission, and the physiological manifestations of the nervous systems control. After examining neural cell function, we begin by exploring the neurophysiological systems involved in sensory pathways including proprioception and vestibular system, pain, vision, auditory, and chemical senses. Then, we apply this knowledge by examining the integration of these systems and their role in normal human physiological function, disease, and performance. Fall or Spring on need.
Prerequisites: (HPHY 376 with a minimum grade of D and HPHY 375 with a minimum grade of D) or NEUR 201 with a minimum grade of D

HPHY 452. Neuromuscular Control. (3 Credits)
This course is designed to provide an overview of the concepts and theories foundational to the control of movement. Topics include the organization and application of neural signals, integration of internal and external feedback, and application of neuromuscular control principles in unimpaired and pathological populations. Fall or Spring on need.
Prerequisites: HPHY 375 with a minimum grade of D

HPHY 453. Neuroanatomy. (3 Credits)
This course offers an in-depth study of the anatomical organization of the human nervous system. Through a combination of lecture and hands-on laboratory experience, students will explore the gross and microscopic structure of the brain and spinal cord, and the relationships between structure and function. Students will also gain practical experience in the handling and examination of human brain specimens.
Prerequisites: (HPHY 242 with a minimum grade of D and HPHY 242L with a minimum grade of D) or NEUR 201 with a minimum grade of D

HPHY 477. Environmental Physiology. (3 Credits)
An in-depth study of specific topics in environmental physiology, including the cellular and systemic responses and adaptations of various organ systems to environmental stress. Fall or Spring on need.
Prerequisites: HPHY 376 with a minimum grade of D and HPHY 376L with a minimum grade of D

HPHY 478. Physiology of Aging. (3 Credits)
This course will examine how and why we age, and why we are susceptible to age associated diseases with a focus on healthspan as well as lifespan. It will introduce epidemiology and terminology of aging, discuss theories on why we age, and examine the 9 hallmarks of aging in depth with an emphasis on etiology of those hallmarks in healthy aging and age associated disease. Fall or Spring on need.
Prerequisites: HPHY 376 with a minimum grade of D and HPHY 376L with a minimum grade of D

HPHY 479. Cell and Molecular Physiology. (3 Credits)
This course will emphasize advanced physiological mechanisms of human cells including signal transduction pathways, cell cycle regulation, and epigenetics. These topics will also emphasize the pathophysiology of chronic human diseases that represent a challenge to modern society including cancer, cardiovascular and infectious diseases. Fall or Spring on need.
Prerequisites: HPHY 376 with a minimum grade of D
Course Fee: 150

HPHY 480. Applied Immunology. (3 Credits)
Begins as a basic immunology course with a focus on immune cells and their development leading to proper or improper immune function and regulation. Second half of the course applies basic principles of immunology to dive into depth on tumor responses, autoimmune conditions, asthma, allergies transplants, etc. Students finish the course by applying what they have learned to an immune topic of their choice for a final presentation.
Prerequisites: HPHY 375 with a minimum grade of D and HPHY 376 with a minimum grade of D
Enrollment is limited to students with a program in Human Physiology.

HPHY 485. Biomedical Engineering. (3 Credits)
This course is designed to provide an introduction to the broad field of biomedical engineering. Special focus will be placed on topics such as mechanical properties of biological tissues, biomaterials and their physiological interactions, biocompatibility, biomedical implants, medical imaging, robotics and prosthetics, and biomedical ethics. Fall or Spring on need.
Prerequisites: (HPHY 375 with a minimum grade of D and HPHY 375L with a minimum grade of D) or ENSC 301 with a minimum grade of D

HPHY 489. Advanced Topics. (2,3 Credits)
May be repeated for credit.
An in-depth review of current research literature on specific topics in human physiology. This course prepares students to study, critically review and evaluate, and discuss results of human physiology research. Fall and Spring.
Prerequisites: (HPHY 375 with a minimum grade of D and HPHY 376 with a minimum grade of D)

HPHY 490. Directed Study. (1-2 Credits)
May be repeated for credit.
Topic to be decided by faculty. Course may be repeated to total not more than 2 credits. By permission from department only. Fall, Spring and Summer.

HPHY 492. Research Techniques. (1-2 Credits)
May be repeated for credit.
An introduction to some of the experimental techniques used in research in human physiology. Course content may vary with instructor. Course may be repeated to total not more than 2 credits. By permission from department only. Fall, Spring and Summer.

HPHY 497. Internship. (0-6 Credits)
May be repeated for credit.
This course is designed to provide students with the opportunity to receive 0 to 6 course credits for professional work experience in a human physiology-related field. The location, duration, learning activities, and specific learning objectives are decided upon through a written agreement established among the student, internship supervisor and the department. This course may be repeated to total not more than 3 credits and is graded as Satisfactory/Non-Satisfactory. By permission from the department only. Credits for this course do not count toward HPHY required 300-400 level elective credits. Fall, Spring, and Summer.
Prerequisites: HPHY 242 with a minimum grade of D and HPHY 242L with a minimum grade of D
Enrollment is limited to students with a program in Human Physiology.

HPHY 498. Directed Research. (1-2 Credits)
May be repeated for credit.
This course provides the motivated student with the opportunity to conduct or assist with a research project under the direction of a human physiology faculty member. Course may be repeated to total not more than 2 credits. Fall, Spring and Summer. By faculty permission only.

HPHY 499. Culminating Experience. (1 Credit)
Required of all HPHY majors in their senior or final year. Spring.
Prerequisites: HPHY 441L with a minimum grade of D and HPHY 442L with a minimum grade of D
Course Fee: 150
Enrollment limited to students with a semester level of Fourth Year (96+ credits).

Enrollment is limited to students with a program in Human Physiology.