Human Physiology

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Human physiology is the science of the mechanical, physical, and biochemical function of humans, and serves as the foundation of modern medicine. As a discipline, it connects science, medicine, and health, and creates a framework for understanding how the human body adapts to stresses, physical activity, and disease.

Human physiology and anatomy are closely related—anatomy is the study of form, physiology is the study of function, and form and function are intrinsically linked. The study of human physiology integrates knowledge across many levels, including biochemistry, cell physiology, and organ systems. Contemporary research in human physiology explores new ways to maintain or improve the quality of life, the development of new medical therapies and interventions, and the unanswered questions about how the human body works. The Department of Human Physiology serves its students by providing strong training in human physiology and anatomy to prepare them for careers in medicine, allied health professions, and biomedical research.

Faculty

Damien Callahan, assistant professor. BA, 2001, Boston; PhD, 2011, Massachusetts, Amherst. (2017)

Hans Dreyer, associate professor. BS, 1998, California State, Long Beach; MS, 2002, PhD, 2004, Southern California. (2009)

Grace Golden, senior lecturer. BS, 1989, MS, 1991, Oregon; PhD, 2007, Oregon State. (2009)

Ian Greenhouse, assistant professor. BA, 2004, Tufts; PhD, 2012, California, San Diego. (2017)

Michael Hahn, associate professor. BS, 1996, Colorado Mesa; MS, 2000, Iowa State; PhD, 2003, Oregon. (2012)

John Halliwill, professor. BS, 1991, Ohio State; PhD, 1995, Medical College of Virginia. (2002)

Robin Hopkins, senior instructor. BS, 2005, Simon Fraser; MS, 2009, Western Ontario; PhD, 2014, British Columbia. (2014)

Adrianne Huxtable, associate professor. BS, 2003, British Columbia; PhD, 2009, Alberta. (2015)

Andrew Karduna, professor. BS, 1989, Massachusetts Institute of Technology; MS, 1991, Johns Hopkins; PhD, 1995, Pennsylvania. (2002)

Andrew Lovering, professor. BS, 1995, PhD, 2003, Texas Tech. (2007)

Michelle Marneweck, assistant professor. BA, 2020, MS/PhD, 2014, Western Australia. (2020)

Philip Matern, senior instructor. BS, 2003, Gonzaga; MS, 2005, Central Washington. (2014)

Carrie McCurdy, associate professor. BS, 1998, Notre Dame; PhD, 2004, Wisconsin, Madison.(2013)

Christopher Minson, Kenneth and Kenda Singer Endowed Professor in Human Physiology. BS, 1989, Arizona; MA, 1993, San Diego State; PhD, 1997, Pennsylvania State. (2000)

Jon Runyeon, senior instructor. BS, 1996, MS, 2010, Oregon. (2012)

Elinor Sullivan, research associate professor, Evergreen Professor. BA, 2000, Willamette; PhD, 2006, Oregon Health and Science. (2017)

Nicole Swann, assistant professor. BA, 2006, California, Berkeley; PhD, 2012, California, San Diego. (2017)

Ashley Walker, assistant professor. BS, 2003, Oregon State; PhD, 2010, Colorado, Boulder. (2017)

Affiliated

Balamurali Ambati, MD, PhD. Courtesy research professor, Phil and Penny Knight Campus for Accelerating Scientific Impact.

Sierra Dawson, PhD. Associate Vice Provost for Academic Affairs.

Jon Elliot, PhD. Instructor pro tem. (2019)

Robert Guldberg, professor; vice president and executive director, Phil and Penny Knight Campus for Accelerating Scientific Impact. BS, 1989, MS, 1992, PhD, 1995, Michigan, Ann Arbor. (2018)

Marian Hettiaratchi, PhD. Assistant Professor, Phil and Penny Knight Campus for Accelerating Scientific Impact.

Austin Hocker, PhD. Assistant Director for Research and Assessment, Teaching Engagement Program.

Brett Kirby, instructor pro tem. BS, 2000, Northern Arizona; BS, 2004, MS, 2007, PhD, 2010, Colorado State. (2016)

Benjamin McKay, MS. Sports Science Coordinator, Intercollegiate Athletics.

Brian Nichols, instructor pro tem. BS, 1987, MS, 1989, Oregon. (2001)

Keat Ghee Ong, PhD. Professor, Phil and Penny Knight Campus for Accelerating Scientific Impact.

Shannon Pomeroy, courtesy instructor. BS, 2013, Michigan; MS, 2016, Oregon. (2018)

Kimberly Terrell, courtesy instructor. BS 1981, MS, 1983, Oregon. (2006)

Brad Wilkins, courtesy instructor. BS, 1993, Oregon State; MS, 1996, Northern Michigan; PhD, 2003, Oregon. (2014)

Ann Zeidman-Karpinski, associate professor. See **Libraries**.

Courtesy

John Bagdade, courtesy research professor. AB, 1958, Harvard; MD, 1962, Cornell. (2017)

Patrick Bergin, courtesy professor. BA, 1976, Columbia College; MD, 1980, Dartmouth College. (2000)

Mark Chesnutt, courtesy research associate. BS, 1982, Pacific Lutheran; MD, 1986, Oregon Health and Science. (2012)

Michael Colasurdo, courtesy professor. BS 1980, Portland State; MD, 1984, Oregon Health and Science. (2009)

Dennis Collis, courtesy professor. BS, 1959, Grinnell College; MD, 1963, Washington (St. Louis). (2007)

Daniel Erichsen, courtesy professor. MD, 2003, Karolinska Institute. (2017)

Mathews Fish, courtesy professor. AB, 1956, California, Berkeley; MD, 1959, California, San Francisco. (2002)

Daniel Fitzpatrick, courtesy associate professor. BS, 1991, MS, 1993, MD, 1997, Iowa. (2007)

Eben Futral, courtesy research associate. BS, 1988, Stanford; MBA, 1999, Arizona State. (2015)

Igor Gladstone, courtesy professor. BS, 1973, MD, 1981, Washington (Seattle). (2009)

Randall Goodman, courtesy research assistant. BS, 1994, Oregon. (2010)

Jerold Hawn, courtesy professor. BS, 1963, Santa Clara; MD, 1967, Georgetown. (2009)

Stanley James, courtesy professor. BS, 1953, MD, 1962, Iowa. (1979)

Brian Jewett, courtesy associate professor. BS, 1990, MS, 1991, Stanford; MD, 1995, Vanderbilt. (2007)

Donald Jones, courtesy professor. BS, 1969, Centenary (Hackettstown); MD, 1973, Louisiana State. (1983)

Paul Kaplan, courtesy research associate; university physician. AB, 1970, Stanford; MD, 1974, California, Los Angeles. (2005)

Vern Katz, courtesy professor. BA, 1971, MD, 1979, California, Los Angeles. (2001)

Peter Kosek, courtesy professor. BA, 1984, Grinnell College; MD, 1988, California, Los Angeles. (2009)

Brett "Brick" Lantz, courtesy professor. BA, 1981, Stanford; MD, 1985, Oklahoma. (2007)

Samuel Lau, courtesy professor. BS, 1984, MD, 1988, Creighton. (2009)

Fuzhong Li, courtesy senior research associate. BS, 1994, Shanghai; MS, 1990, Oregon; PhD, 1996, Oregon State. (2013)

Victor Lin, courtesy associate professor. BS, 1988, Massachusetts Institute of Technology; MS, 1991, California, Berkeley; MD, California, San Francisco. (2002)

Elizabeth McCorkle, courtesy research associate. BA, 1987, Rollins College; MD, 1992, Augusta. (2016)

Gregory Moore, courtesy assistant professor. BS, 1995 Southern Methodist; MS, 1999, Oregon State; MD, 2003, Texas, San Antonio. (2013)

Richard Padgett, courtesy professor. BS, 1984, East Carolina; MD, 1988, North Carolina, Chapel Hill. (2005)

Matthew Shapiro, courtesy research associate. BA, 1979, Cornell; MD, 1983, Columbia. (2015)

Grant Simmons, courtesy research associate. BS, 2003, MS, 2005, PhD, 2008 Oregon. (2018)

Kenneth Singer, courtesy professor; team physician. BS, 1961, Massachusetts Institute of Technology; MD, 1965, Columbia University College of Physicians and Surgeons. (1994)

Emeriti

Barry Bates, professor emeritus. BSE, 1960, Princeton; MEd, 1971, East Stroudsburg; PhD, 1973, Indiana. (1974)

Gary Klug, professor emeritus. BS, 1970, MS, 1973, Wisconsin, La Crosse; PhD, 1980, Washington State. (1985)

Louis Osternig, professor emeritus. BS, 1965, MS, 1967, California State, Hayward; PhD, 1971, Oregon. (1971)

Richard Troxel, senior instructor emeritus. BS, 1975, MS, 1977, Oregon. (1976)

Marjorie Woollacott, professor emerita. BA, 1968, PhD, 1973, Southern California. (1980)

The date in parentheses at the end of each entry is the first year on the University of Oregon faculty.

- **Bachelor of Arts**
- **Bachelor of Science**

Undergraduate Studies

The department offers a program leading to either a bachelor of science (BS) or a bachelor of arts (BA) degree.

The rigorous undergraduate curriculum provides an in-depth exploration of the field as well as a strong foundation for future studies. Majors complete sequences in biology, chemistry, physics, and mathematics, in addition to upper-level course work in human physiology.

Preparation

High school preparation should include a strong background in chemistry, biology, mathematics, and physics. Students involved in Advanced Placement (AP) or International Baccalaureate (IB) programs can complete some lower division requirements by earning sufficient test scores. However, some graduate degree programs may require students to complete these courses at the collegiate level.

Transfer Students

Before transferring, students should complete as many general-education requirements and lower-division major requirements as possible, including general chemistry, general biology, general physics, and mathematics. Students should ensure that courses transfer specifically as required sequences. The University's Transfer Course Equivalency (http://registrar.uoregon.edu/transfer-students/) tool is a helpful resource.

The anatomy and physiology sequence (HPHY 321–325) provides the bulk of upper-division credits human physiology majors complete. The courses are the foundation on which students learn the human physiology culture and expectations, and are designed to prepare students for senior-level course work in the major. As a result, HPHY 321–325 must be completed in residence at the University of Oregon; transfer students should plan on taking the courses on the UO campus.

Scholarships

Numerous scholarships are available; a complete list is available on the department website.

Careers

A degree in human physiology prepares students to be critical thinkers who can independently assess their own personal health, using the guiding principles of scientific inquiry as a model for understanding the world around them. Students seeking a career in medicine, dentistry, physical therapy, or other health professions should work closely with the human physiology undergraduate advisor as well as health professions advisors to plan their program of study to meet the specific admission requirements of the postgraduate schools in which they are interested. Information on additional courses that may be required for graduate programs is available from the Health Professions Program (http://healthprofessions.uoregon.edu/health-fields/) website.

Bachelor of Arts Degree Requirements

Code	Title	Credits
Lower-Division Requirements		
CH 221 & CH 222 & CH 223	General Chemistry I and General Chemistry II and General Chemistry III [1]	12
or CH 224H & CH 225H & CH 226H	Advanced General Chemistry I and Advanced General Chemistry II and Advanced General Chemistry III	
CH 227 & CH 228 & CH 229	General Chemistry Laboratory and General Chemistry Laboratory and General Chemistry Laboratory	6
or PHYS 204 & PHYS 205 & PHYS 206	Introductory Physics Laboratory and Introductory Physics Laboratory and Introductory Physics Laboratory	
BI 211 & BI 212 & BI 213	General Biology I: Cells and General Biology II: Organisms and General Biology III: Populations (may substitute BI 214 for BI 213)	12-15
or BI 281H & BI 282H & BI 283H	Honors Biology I: Cells, Biochemistry and Physiology and Honors Biology II: Genetics and Molecular Biology and Honors Biology III: Evolution, Diversity and Ecology	
MATH 246	Calculus for the Biological Sciences I [1]	4
or MATH 251	Calculus I	
PHYS 201 & PHYS 202 & PHYS 203	General Physics and General Physics and General Physics	12
or PHYS 251 & PHYS 252 & PHYS 253	Foundations of Physics I and Foundations of Physics I and Foundations of Physics I	
HPHY 211	Medical Terminology	3
HPHY 212	Scientific Investigation in Physiology	4
Upper-Division Requirements		
HPHY 321	Human Anatomy I [2]	5
HPHY 322	Human Physiology I [2]	5
HPHY 323	Human Anatomy II [2]	5
HPHY 324	Human Physiology II [2]	5
HPHY 325	Human Anatomy and Physiology III [2]	5
HPHY 371	Physiology of Exercise	4
Upper-Division Electives		**16**
Select at least two of the following:		
HPHY 333	Motor Control	
HPHY 362	Tissue Injury and Repair	
HPHY 374	Clinical Electrocardiography and Exercise	
HPHY 375	Metabolism and Nutrition	
HPHY 381	Biomechanics	
HPHY 399	Special Studies: [Topic]	
ANTH 362	Human Biological Variation	
ANTH 366	Human Osteology Laboratory	
ANTH 369	Human Growth and Development	
BI 309	Tropical Diseases in Africa	
BI 320	Molecular Genetics	
BI 322	Cell Biology	
BI 358	Investigations in Medical Physiology	
BI 360	Neurobiology	
CH 360	Physiological Biochemistry	
CH 462	Biochemistry	
Select at least one of the following capstone courses:		
HPHY 412	Sleep Physiology	
HPHY 413	Muscle Structure, Function, and Plasticity	
HPHY 414	Muscle Metabolism	
HPHY 422	Physiology of Obesity	
HPHY 423	Physiology of Aging	
HPHY 432	Neural Development	
HPHY 433	Neurophysiology of Concussion	
HPHY 434	Movement Disorders	
HPHY 436	Clinical Neuroscience	
HPHY 444	Clinical Anatomy	
HPHY 462	Therapeutic Techniques	
HPHY 470	Environmental Physiology	
HPHY 472	Science of Athletic Performance	
HPHY 473	High Altitude Physiology and Medicine	
Select any of the following:		
HPHY 401	Research: [Topic]	
HPHY 403	Thesis	
HPHY 404	Internship: [Topic]	
HPHY 405	Reading and Conference: [Topic]	
HPHY 406	Special Problems: [Topic]	
HPHY 408	Workshop: [Topic]	
HPHY 409	Practicum: [Topic] (Anatomy and Physiology Teaching Assistant)	
HPHY 411	Scientific Teaching	
HPHY 420	Human Anatomy Dissection	

1 Should be taken in the first year.

2 Must be taken in residence at the University of Oregon.

Bachelor of Science Degree Requirements

Code	Title	Credits
Lower-Division Requirements		
CH 221–223	General Chemistry [1]	12
or CH 224H–226H	Honors General Chemistry	
PHYS 201–203	General Physics	12
or PHYS 251–253	Foundations of Physics I	
CH 227–229	General Chemistry Laboratory	6
or PHYS 204–206	Introductory Physics Laboratory	
BI 211–213	General Biology I-III (may substitute BI 214 for BI 213)	12-15
or BI 281H–283H	Honors Biology I-III	
MATH 246	Calculus for the Biological Sciences I [1]	4
or MATH 251	Calculus I	
HPHY 211	Medical Terminology	3
HPHY 212	Scientific Investigation in Physiology	4
Upper-Division Requirements		
HPHY 321	Human Anatomy I [2]	5
HPHY 322	Human Physiology I [2]	5
HPHY 323	Human Anatomy II [2]	5
HPHY 324	Human Physiology II [2]	5
HPHY 325	Human Anatomy and Physiology III [2]	5
HPHY 371	Physiology of Exercise	4
Upper-Division Electives		**16**
Select at least two of the following:		
HPHY 333	Motor Control	
HPHY 362	Tissue Injury and Repair	
HPHY 374	Clinical Electrocardiography and Exercise	
HPHY 375	Metabolism and Nutrition	
HPHY 381	Biomechanics	
HPHY 399	Special Studies: [Topic]	
ANTH 362	Human Biological Variation	
ANTH 366	Human Osteology Laboratory	
ANTH 369	Human Growth and Development	
BI 309	Tropical Diseases in Africa	
BI 320	Molecular Genetics	
BI 322	Cell Biology	
BI 358	Investigations in Medical Physiology	
BI 360	Neurobiology	
CH 360	Physiological Biochemistry	
CH 462	Biochemistry	
Select at least one of the following capstone courses:		
HPHY 412	Sleep Physiology	
HPHY 413	Muscle Structure, Function, and Plasticity	
HPHY 414	Muscle Metabolism	
HPHY 422	Physiology of Obesity	
HPHY 423	Physiology of Aging	
HPHY 433	Neurophysiology of Concussion	
HPHY 432	Neural Development	
HPHY 434	Movement Disorders	
HPHY 436	Clinical Neuroscience	
HPHY 444	Clinical Anatomy	
HPHY 462	Therapeutic Techniques	
HPHY 470	Environmental Physiology	
HPHY 472	Science of Athletic Performance	
HPHY 473	High Altitude Physiology and Medicine	
Select any of the following:		
HPHY 401	Research: [Topic]	
HPHY 403	Thesis	
HPHY 404	Internship: [Topic]	
HPHY 405	Reading and Conference: [Topic]	
HPHY 406	Special Problems: [Topic]	
HPHY 408	Workshop: [Topic]	
HPHY 409	Practicum: [Topic]	
HPHY 409	Practicum: [Topic] (Anatomy and Physiology Teaching Assistant)	
HPHY 411	Scientific Teaching	
HPHY 420	Human Anatomy Dissection	

[1] Should be taken in the first year.

[2] Must be taken in residence at the University of Oregon.

Courses required for the major must be taken for letter grades and passed with grades of mid-C or better. Required preparatory and upper-division core courses may be repeated only once, including attempts that result in a grade of "W" (withdrawal). Students must maintain at least an overall 2.00 grade point average in courses required for the major.

Additional requirements for the bachelor's degree are described in the **Bachelor's Degree Requirements** section of this catalog.

Honors

To apply to graduate with departmental honors, a student must have a GPA of 3.50 or better in courses applied toward the human physiology degree requirements and complete an honors thesis under the supervision of a human physiology thesis committee. In addition, human physiology majors enrolled in the Robert Donald Clark Honors College at the University of Oregon are eligible to complete an honors thesis through that program.

Four-Year Degree Plan

The degree plan shown is only a sample of how students may complete their degrees in four years. There are alternative ways. Students should consult their advisor to determine the best path for them.

The bachelor of science is shown below. A bachelor of arts in human physiology may be earned by completing (or demonstrating proficiency in) two years of a foreign language.

Bachelor of Science in Human Physiology

Course	Title	Credits	Milestones
First Year			
Fall			
MATH 112	Elementary Functions [1]	4	
CH 221	General Chemistry I	4	

CH 227	General Chemistry Laboratory	2
General-education course [2]		4
Elective course		1
	Credits	15
Winter		
WR 121	College Composition I	4
CH 222	General Chemistry II	4
CH 228	General Chemistry Laboratory	2
MATH 251 or MATH 246	Calculus I or Calculus for the Biological Sciences I	4
Elective course		2
	Credits	16
Spring		
CH 223	General Chemistry III	4
CH 229	General Chemistry Laboratory	2
MATH 243	Introduction to Methods of Probability and Statistics	4
General-education course [2]		4
Elective Course		2
	Credits	16
	Total Credits	47

Course	Title	Credits	Milestones
Second Year			
Fall			
BI 211	General Biology I: Cells	4	
HPHY 211	Medical Terminology	3	
General-education course [2]		4	
Elective course		4	
	Credits	15	
Winter			
BI 212	General Biology II: Organisms	4	
HPHY 212	Scientific Investigation in Physiology	4	
General-education course [2]		4	
Elective course		4	
	Credits	16	
Spring			
WR 122 or WR 123	College Composition II or College Composition III	4	
BI 213 or BI 214	General Biology III: Populations or General Biology IV: Mechanisms	4	
General-education course [2]		4	
Elective course		4	
	Credits	16	
	Total Credits	47	

Course	Title	Credits	Milestones
Third Year			
Fall			
HPHY 321	Human Anatomy I	5	
HPHY 322	Human Physiology I	5	
Upper-division elective courses		3	
	Credits	13	
Winter			
HPHY 323	Human Anatomy II	5	
HPHY 324	Human Physiology II	5	
Upper-division elective courses		3	
	Credits	13	
Spring			
HPHY 325	Human Anatomy and Physiology III	5	
HPHY 371	Physiology of Exercise	4	Completion of HPHY 321-325 & 371
General-education course [2]		4	
Upper-division elective course		2	
	Credits	15	
	Total Credits	41	

Course	Title	Credits	Milestones
Fourth Year			
Fall			
PHYS 201	General Physics	4	
Human physiology course chosen from List A [3]		4	
General-education course [2]		4	
Upper-division elective course		3	
	Credits	15	
Winter			
PHYS 202	General Physics	4	
Human physiology course chosen from List A [3]		4	
Human physiology course chosen from List B [3]		4	
Upper-division elective course		3	
	Credits	15	
Spring			
PHYS 203	General Physics	4	
Human physiology course chosen from List A or List B [3]		4	
General-education course [2]		4	
Upper-division elective course		3	
	Credits	15	
	Total Credits	45	

1 Students not starting in Elementary Functions (MATH 112) may require additional terms to graduate.

2 To complete general-education requirements within eight courses, students must take arts and letters or social science group-satisfying courses that also satisfy multicultural requirements.

[3] List A and List B options may be found online (https://physiology.uoregon.edu/wp-content/uploads/sites/5/2013/03/HPHY-Major-Requirements.pdf).

- **Master of Science: Athletic Training Emphasis**
- **Master of Science–Doctor of Philosophy: Research-Intensive Emphasis**

Graduate Studies

The Department of Human Physiology offers two graduate programs: the athletic training MS program and the research-intensive MS-PhD program.

Athletic Training MS Program

The department offers a graduate program in human physiology with an emphasis in athletic training leading to the master of science (MS). The primary goal of this program is to provide classroom and clinical experiences that will allow entry-level certified athletic trainers to grow into professionals with the experience and confidence to be great clinicians. Providing students with advanced clinical skills is our hallmark. The program also provides students with the opportunity to grow as leaders, teachers, and researchers. Admission is granted only to students who are certified by the CAATE Board of Certification or who have qualified for the certification examination. Graduate employee (GE) positions are available for highly qualified students who are certified as athletic trainers. The GE award provides a full tuition waiver and a monthly stipend that varies in amount according to the assignment. Employment settings include intercollegiate athletics, club and recreational sports, and teaching. Qualified students can find more information at the Graduate Studies in Athletic Training website (http://pages.uoregon.edu/uogradat/). (http://pages.uoregon.edu/uogradat/)

Master of Science Degree Requirements: Athletic Training

Code	Title	Credits
HPHY 520	Human Anatomy Dissection	2
HPHY 533	Neurophysiology of Concussion	4
HPHY 570	Environmental Physiology	4
HPHY 611	Professional Skills I: Effective Teaching	1
HPHY 660	Basic Science in Clinical Decisions	4
HPHY 661	Manual Therapy: Movement Patterns, Core Stability	2
HPHY 662	Manual Therapy: Spine, Lower Quadrant	2
HPHY 669	The Female Athlete	4
HPHY 671	Therapeutic Restoration of Biomotor Abilities	3
EDUC 614	Educational Statistics	4
HPHY 607	Seminar: [Topic] (Administrative Skills for Clinical Careers)	1
HPHY 607	Seminar: [Topic] (Clinical Research Presentations [two terms])	2
HPHY 607	Seminar: [Topic] (Contemporary Clinical Techniques I,II)	2
HPHY 607	Seminar: [Topic] (Current Professional Topics)	1
HPHY 607	Seminar: [Topic] (Evidence-Based Clinical Practice and Research)	2
HPHY 607	Seminar: [Topic] (Human Physiology [six terms])	6
HPHY 607	Seminar: [Topic] (Leadership Development)	1
HPHY 609	Practicum: [Topic[(Sports Medicine)	3
Select one of the following:		4
HPHY 601	Research: [Topic]	
HPHY 606	Special Problems: [Topic]	
HPHY 609	Practicum: [Topic[(Preceptor)	
Other human physiology courses		
Total Credits		52

Exit Requirement

All students participate in a comprehensive defense of their advanced clinical skills during spring term of their graduating year. In addition, they select one of the following two options as their graduation exit requirement:

- **Option 1.** Comprehensive written and oral exams (completed during the final term of study), one-term (4-credit minimum) research experience, and literature review or evidence-based practice manuscript submitted for publication.
- **Option 2.** Original research study conducted, and manuscript submitted for publication.

Additional Requirements

Required courses must be taken for letter grades and passed with grades of B– or better. Students must maintain at least a 3.00 grade point average each term, and will not be eligible to hold a graduate employee (GE) position, take comprehensive exams, or graduate without a cumulative GPA of 3.00. Additional university master's degree requirements are described under Master's Degrees in the **Graduate School** section of this catalog.

Research-Intensive Master of Science–Doctor of Philosophy Program

The department offers a graduate program in human physiology with an emphasis on research leading through the master of science (MS) degree to the doctor of philosophy (PhD) degree. The goal is to provide classroom and research experiences that turn students into professionals with the knowledge and experience to be superior researchers or become university-level educators. This is an individualized program with a strong emphasis on research. Decisions on accepting applicants to the graduate program are made by the faculty members, and are based on available laboratory space and financial support—both of which vary greatly from year to year. graduate employee (GE) opportunities and research fellowships are available for highly qualified students to teach undergraduate laboratories or assist in research projects. The GE award provides a full-tuition waiver and a monthly stipend that varies in amount according to the assignment. For more information, visit the department website.

Master of Science Degree Requirements

Code	Title	Credits
HPHY 611 & HPHY 612 & HPHY 613	Professional Skills I: Effective Teaching and Professional Skills II: Responsible Research and Professional Skills III: Career Development	3
HPHY 621 & HPHY 622 & HPHY 623	Systems Physiology I and Systems Physiology II and Systems Physiology III	12
EDUC 614	Educational Statistics [1]	3
EDUC 640	Applied Statistical Design and Analysis [1]	3
Human physiology courses or other courses most appropriate to student's line of study [2]		4
Total Credits		25

1. Statistical analysis courses covering the following topics: descriptive statistics, logic of hypothesis testing, elementary inferential statistics, confidence intervals, one-way analysis of variance, post hoc comparisons, a priori contrasts, within-subjects and between-subjects effects, two-way and higher-order designs, and interactions. For recent additions to these course options, check with the director of graduate studies for the department.
2. Determined in conjunction with program committee.

Additional Requirements

The master of science degree requires completion of a substantial research project. Department faculty members, in consultation with the student, determine the format for the presentation of the project, which will include an oral defense in combination with either a master's thesis, a journal-style manuscript, or a comprehensive project report. Required courses must be taken for letter grades and passed with grades of B– or better. Students must maintain at least a 3.00 grade point average for all courses. Additional university master's degree requirements are described under Master's Degrees in the **Graduate School** section of this catalog.

Doctor of Philosophy Degree Requirements

Code	Title	Credits
HPHY 611 & HPHY 612 & HPHY 613	Professional Skills I: Effective Teaching and Professional Skills II: Responsible Research and Professional Skills III: Career Development	3
HPHY 621 & HPHY 622 & HPHY 623	Systems Physiology I and Systems Physiology II and Systems Physiology III	12
EDUC 614	Educational Statistics [1]	3
EDUC 640	Applied Statistical Design and Analysis [1]	3
Human physiology courses or other courses most appropriate to student's line of study [2]		4
Select one of the following:		4
HPHY 670	Advanced Respiratory Physiology	
HPHY 676	Human Cardiovascular Control	
HPHY 684	Kinematics of Human Movement	
HPHY 685	Kinetics of Human Movement	
HPHY 603	Dissertation [3]	1-16
Total Credits		30-45

1. Statistical analysis courses covering the following topics: descriptive statistics, logic of hypothesis testing, elementary inferential statistics, confidence intervals, one-way analysis of variance, post hoc comparisons, a priori contrasts, within-subjects and between-subjects effects, two-way and higher-order designs, and interactions. For recent additions to these course options, check with the director of graduate studies for the department.
2. Determined in conjunction with program committee.
3. Must register for course every term of enrollment after advancing to candidacy.

The doctoral degree requires completion of a minimum of 135 credits beyond the bachelor's degree; at least 60 of these credits must be completed through human physiology courses. Written and oral doctoral comprehensive examinations are taken after completing a substantial portion of the program of study. Upon passing these examinations, the student is advanced to candidacy. A final oral defense is held after completion of the dissertation and after all other degree requirements have been met. Required courses must be taken for letter grades and passed with grades of B– or better. Students must maintain at least a 3.00 grade point average for all courses. Additional university doctor of philosophy degree requirements are described under Doctoral Degrees in the **Graduate School** section of this catalog

Admission Requirements

Applicants for the athletic training MS program should check the Graduate Studies in Athletic Training website (http://pages.uoregon.edu/uogradat/) and applicants for the research-intensive MS-PhD program should check the department website (http://physiology.uoregon.edu) for information on the online graduate application and deadlines.

Recommended criteria for applying to all graduate programs include the following:

- Baccalaureate degree from an accredited university with a GPA of 3.40 or higher on a 4.00 scale
- Completed course work with a grade of B+ or better in general chemistry, general biology, and two courses of physiology or combined anatomy and physiology
- International students who have not received a degree from a university in a country whose official language is English must have a TOEFL score of 575 (paper test) or 90 (Internet-based test) or an IELTS overall band score of 7.0.

Minimum requirements for admission to all graduate programs include the following:

- Baccalaureate degree from an accredited university with a GPA of 3.00 or higher on a 4.00 scale
- Completed course work with a grade of B– or better in general chemistry, general biology, and two courses of physiology or combined anatomy and physiology
- International students who have not received a degree from a university in a country whose official language is English must have a TOEFL score of 575 (paper test) or 90 (Internet-based test) or an IELTS overall band score of 7.0

In addition, for graduate studies in athletic training:

- Recommended GRE scores of 153 or better on each of the verbal and quantitative sections (institution code: 4846; department code: 0217); minimum GRE scores of 148 or better on each of the verbal and quantitative sections
- Completed course work with a grade of B– or better in physics and biomechanics
- Must be a certified athletics trainer at time of matriculation

Courses

HPHY 103. Exercise and Performance. 4 Credits.
Structure and function of the human body including movement analysis. Topics include training and exercise responses; sport, daily living, and workplace performance; and injury adaptations.

HPHY 105. Principles of Nutrition. 4 Credits.
Explores the fundamentals of nutrition and its application to culture, lifestyle, and health as they relate to humans across the lifespan. Course will be taught once or more per academic year.

HPHY 111. The Science of Sex. 4 Credits.
The anatomy and physiology of sex, with assignments and discussion designed to develop scientific literacy.

HPHY 112. The Science of Health. 4 Credits.
Examines and assesses current health claims and controversies.

HPHY 199. Special Studies: [Topic]. 1-4 Credits.
Repeatable.

HPHY 211. Medical Terminology. 3 Credits.
Explore and develop skills in language and terminology specific to the medical sciences with an emphasis on derivation, meaning, and pronunciation.

HPHY 212. Scientific Investigation in Physiology. 4 Credits.
Explores the process of conducting and communicating scientific research, and how data and statistics help us build and understand scientific knowledge about physiology and medicine.

HPHY 321. Human Anatomy I. 5 Credits.
Introduction to the human body and histology; nerves; central, autonomic, and peripheral nervous systems; cranial nerves; regional anatomy of the head; special senses. Includes cadaver laboratory. Sequence with HPHY 322, 323, 324, 325.
Prereq: HPHY 211; BI 211 or BI 281H; BI 212 or BI 282H; CH 221 or CH 224H; CH 222 or CH 225H; CH 223 or CH 226H; MATH 246 or MATH 251. Must be passed with grades of C or better.

HPHY 322. Human Physiology I. 5 Credits.
Neuro- and muscular physiology: action potentials; synapses and receptors; skeletal muscle; central, peripheral, and autonomic nervous systems; special senses. Includes human-based laboratory. Sequence with HPHY 321, 323, 324, 325.
Prereq: HPHY 212; BI 211 or BI 281H; BI 212 or BI 282H; CH 221 or CH 224H; CH 222 or CH 225H; CH 223 or CH 226H; MATH 246 or MATH 251. Must be passed with grades of C or better.

HPHY 323. Human Anatomy II. 5 Credits.
Heart, lungs, and vasculature in addition to regional exploration of the musculosketetal system. Includes cadaver laboratory. Sequence with HPHY 321, 322, 324, 325.
Prereq: HPHY 321. Must be passed with grades of C or better.

HPHY 324. Human Physiology II. 5 Credits.
Cardiovascular system; respiratory system; immunology. Includes human-based laboratory. Sequence with HPHY 321, 322, 323, 325.
Prereq: HPHY 212, HPHY 321, HPHY 322. Must be passed with grades of C or better.

HPHY 325. Human Anatomy and Physiology III. 5 Credits.
Anatomy and physiology of the digestive, reproductive, and renal systems; endocrinology. Includes combination of cadaver laboratory and human-based laboratory. Sequence with HPHY 321, 322, 323, 324.
Prereq: HPHY 323, HPHY 324. Must be passed with a grade of C or better.

HPHY 333. Motor Control. 4 Credits.
Introduction to the processes of control and coordination in the performance of motor skills. Neurophysiological, mechanical, and cognitive bases of motor skill acquisition.
Prereq: HPHY 321, HPHY 322; or PSY 304. Must be passed with grades of C or better.

HPHY 362. Tissue Injury and Repair. 4 Credits.
Exploration of the physiology of injury and trauma. Emphasis on inflammation and healing of connective tissue injury, tissue biomechanics, mechanisms of injury, and clinical orthopedic evaluation techniques.
Prereq: HPHY 323, HPHY 324. Must be passed with grades of C or better.

HPHY 371. Physiology of Exercise. 4 Credits.
Physiology of exercise, physical conditioning, and training; mechanisms and significance of these effects for health and performance.
Prereq: HPHY 323, HPHY 324. Must be passed with a grade of C or better.

HPHY 374. Clinical Electrocardiography and Exercise. 4 Credits.
Overview of pathophysiology, diagnostic testing, exercise prescription and rehabilitation of cardiovascular diseases. Incorporated throughout the course, students will learn the fundamentals of electrocardiography and how this tool is applied in both the diagnostic and rehabilitative settings.
Prereq: HPHY 371. Must be passed with grades of C or better.

HPHY 375. Metabolism and Nutrition. 4 Credits.
Exploration of cellular, tissue, and whole body integrated metabolic processes as the basis of physiologic function. Integrating the metabolism of macronutrients at the cellular, tissue, and whole body systems level in the context of human growth, function, and disease.
Prereq: HPHY 325, HPHY 371. Must be passed with grades of C or better.

HPHY 381. Biomechanics. 4 Credits.
Fundamental principles of physics applied to the analysis of human movement. Emphasis on developing abilities to analyze human movement quantitatively.
Prereq: HPHY 323, PHYS 201. Must be passed with grades of C or better.

HPHY 399. Special Studies: [Topic]. 1-4 Credits.
Repeatable.
Prereq: HPHY 325 or HPHY 371. Must be passed with grades of C or better.

HPHY 401. Research: [Topic]. 1-15 Credits.
Repeatable.

HPHY 403. Thesis. 1-4 Credits.
For honors students during the terms in which they conduct research or write a thesis.

HPHY 404. Internship: [Topic]. 1-16 Credits.
Repeatable. Field experience in an agency, institution, or business. Practice knowledge from courses: planning, organizing, directing, evaluating, and developing professional competence.

HPHY 405. Reading and Conference: [Topic]. 1-15 Credits.
Repeatable. Reading and assignments in connection with other courses for extra credit. Honors readings.

HPHY 406. Special Problems: [Topic]. 1-15 Credits.
Repeatable.

HPHY 407. Seminar: [Topic]. 1-5 Credits.
Repeatable. Topics are offered regularly in such areas as health sciences, motor control, biomechanics, and physiology.

HPHY 408. Workshop: [Topic]. 1-15 Credits.
Repeatable.

HPHY 409. Practicum: [Topic]. 1-15 Credits.
Repeatable. Assist students learning anatomy or physiology in either the lecture or lab courses.

HPHY 410. Experimental Course: [Topic]. 1-5 Credits.
Repeatable.
Prereq: HPHY 325 or HPHY 371. Must be passed with grades of C or better.

HPHY 411. Scientific Teaching. 1 Credit.
For students currently completing the human anatomy and physiology core sequence; focuses on how people learn, evidence-based teaching practices, and strategies to improve student inclusion and representation.
Prereq: HPHY 211, HPHY 212.

HPHY 412. Sleep Physiology. 4 Credits.
Fundamental principles of sleep and how physiology is affected by sleep.
Prereq: HPHY 325 with a C or better.

HPHY 413. Muscle Structure, Function, and Plasticity. 4 Credits.
Physiologic basis for skeletal muscle adaptation to increased and decreased use and injury. Emphasizes how structure dictates function relevant to rehabilitation.
Prereq: HPHY 323, HPHY 324. Must be passed with a grade of C or better.

HPHY 414. Muscle Metabolism. 4 Credits.
Metabolic basis for skeletal muscle adaptation to increased and decreased use, and injury models. Emphasizes interorgan communication; uses clinical models.
Prereq: HPHY 371. Must be passed with grades of C or better.

HPHY 420. Human Anatomy Dissection. 2 Credits.
Dissection of one region of a preserved donated human cadaver and preparation of the specimen for the HPHY 321/HPHY 323/HPHY 325 laboratory experience. Students are accepted by application, which are due early February.
Prereq: HPHY 323. Must be passed with grades of C or better.

HPHY 422. Physiology of Obesity. 4 Credits.
Explores potential causes of the obesity epidemic, cellular mechanisms linking obesity to insulin resistance and metabolic diseases, and interventions in treatment of metabolic disease and obesity.
Prereq: HPHY 325, HPHY 371 with a C or better.

HPHY 423. Physiology of Aging. 4 Credits.
Examines changes that occur to cells and organs in old age and the causes of age-related disease and dysfunction (cardiovascular disease, diabetes, osteoporosis, Alzheimer's); interventions to increase longevity.
Prereq: HPHY 325 with a C or better.

HPHY 432. Neural Development. 4 Credits.
Exploration of development of the cells in the nervous system. We will discuss the importance of "critical periods" in development and how interventions or dysfunction during critical periods can lead to neurodevelopmental disorders using the respiratory system as a model system.
Prereq: HPHY 323, HPHY 324. Must be passed with grades of C or better.

HPHY 433. Neurophysiology of Concussion. 4 Credits.
Investigate diagnosis, deficits, and treatment of mild traumatic brain injury and neurophysiological effects.
Prereq: HPHY 325, HPHY 333. Must be passed with grades of C or better.

HPHY 434. Movement Disorders. 4 Credits.
Discusses the clinical manifestations and underlying physiological mechanisms of selected movement disorders. Emphasizes the role of scientific experiment in diagnosis and treatment.
Prereq: HPHY 325, HPHY 333. Must be passed with grades of C or better.

HPHY 436. Clinical Neuroscience. 4 Credits.
This course covers neurological diseases and disorders from a neuroscience perspective. The focus will be on applying basic neuroscience principles to better understand clinical practices including patient diagnosis and treatments.
Prereq: HPHY 323 and 324 with a C or better.

HPHY 444. Clinical Anatomy. 4 Credits.
Through case-based learning, students have the opportunity to apply the knowledge of anatomy and physiology in the context of clinical practice and diagnosis.
Prereq: HPHY 325. Must be passed with grades of C or better.

HPHY 462. Therapeutic Techniques. 4 Credits.
Clinical application of therapeutic techniques including modalities and rehabilitation for soft-tissue orthopedic injuries. Offered alternate years.
Prereq: HPHY 362. Must be passed with grades of C or better.

HPHY 470. Environmental Physiology. 4 Credits.
Examination of physiological adaptations to acute and chronic exposure to extreme heat, cold, and high altitude.
Prereq: HPHY 371. Must be passed with grades of C or better.

HPHY 472. Science of Athletic Performance. 4 Credits.
Theoretical basis and practical application of modern physiological testing of cardiovascular and respiratory function with a focus on exercise and performance.
Prereq: HPHY 371. Must be passed with grades of C or better.

HPHY 473. High Altitude Physiology and Medicine. 4 Credits.
Explores major physiologic responses to high altitude (hypoxia), both adaptive and maladaptive, from systems to molecular level, as well as pathophysiologic conditions at high altitude. Offered alternate years.
Prereq: HPHY 325 and 371. Must be passed with grades of C or better.

HPHY 503. Thesis. 1-16 Credits.
Repeatable.

HPHY 507. Seminar: [Topic]. 1-5 Credits.
Repeatable. Topics are offered regularly in such areas as health sciences, motor control, biomechanics, and physiology.

HPHY 508. Workshop: [Topic]. 1-15 Credits.
Repeatable.

HPHY 510. Experimental Course: [Topic]. 1-5 Credits.
Repeatable.

HPHY 512. Sleep Physiology. 4 Credits.
Fundamental principles of sleep and how physiology is affected by sleep.

HPHY 513. Muscle Structure, Function, and Plasticity. 4 Credits.
Physiologic basis for skeletal muscle adaptation to increased and decreased use and injury. Emphasizes how structure dictates function relevant to rehabilitation.

HPHY 514. Muscle Metabolism. 4 Credits.
Metabolic basis for skeletal muscle adaptation to increased and decreased use, and injury models. Emphasizes interorgan communication; uses clinical models.

HPHY 520. Human Anatomy Dissection. 2 Credits.
Dissection of one region of a preserved donated human cadaver and preparation of the specimen for the HPHY 321/HPHY 323/HPHY 325 laboratory experience. Students are accepted by application, which are due early February.

HPHY 522. Physiology of Obesity. 4 Credits.
Explores potential causes of the obesity epidemic, cellular mechanisms linking obesity to insulin resistance and metabolic diseases, and interventions in treatment of metabolic disease and obesity.

HPHY 523. Physiology of Aging. 4 Credits.
Examines changes that occur to cells and organs in old age and the causes of age-related disease and dysfunction (cardiovascular disease, diabetes, osteoporosis, Alzheimer's); interventions to increase longevity.

HPHY 532. Neural Development. 4 Credits.
Exploration of development of the cells in the nervous system. We will discuss the importance of "critical periods" in development and how interventions or dysfunction during critical periods can lead to neurodevelopmental disorders using the respiratory system as a model system.

HPHY 533. Neurophysiology of Concussion. 4 Credits.
Investigate diagnosis, deficits, and treatment of mild traumatic brain injury and neurophysiological effects.

HPHY 534. Movement Disorders. 4 Credits.
Discusses the clinical manifestations and underlying physiological mechanisms of selected movement disorders. Emphasizes the role of scientific experiment in diagnosis and treatment.

HPHY 536. Clinical Neuroscience. 4 Credits.
This course covers neurological diseases and disorders from a neuroscience perspective. The focus will be on applying basic neuroscience principles to better understand clinical practices including patient diagnosis and treatments.

HPHY 570. Environmental Physiology. 4 Credits.
Examination of physiological adaptations to acute and chronic exposure to extreme heat, cold, and high altitude.

HPHY 573. High Altitude Physiology and Medicine. 4 Credits.
Explores major physiologic responses to high altitude (hypoxia), both adaptive and maladaptive, from systems to molecular level, as well as pathophysiologic conditions at high altitude. Offered alternate years.

HPHY 601. Research: [Topic]. 1-16 Credits.
Repeatable.

HPHY 602. Supervised College Teaching. 1-5 Credits.
Repeatable.

HPHY 603. Dissertation. 1-16 Credits.
Repeatable.

HPHY 605. Reading and Conference: [Topic]. 1-15 Credits.
Repeatable.

HPHY 606. Special Problems: [Topic]. 1-16 Credits.
Repeatable. Selected problems in the field of human physiology.

HPHY 607. Seminar: [Topic]. 1-9 Credits.
Repeatable. Topics are offered regularly in such areas as health sciences, motor control, biomechanics, and physiology.

HPHY 608. Workshop: [Topic]. 1-15 Credits.
Repeatable.

HPHY 609. Practicum: [Topic[. 1-15 Credits.
Repeatable.

HPHY 610. Experimental Course: [Topic]. 1-5 Credits.
Repeatable.

HPHY 611. Professional Skills I: Effective Teaching. 1 Credit.
Development of professional skills for academic careers related to human physiology. Sequence with HPHY 612, 613.

HPHY 612. Professional Skills II: Responsible Research. 1 Credit.
Development of professional skills for academic careers related to human physiology. Sequence with HPHY 611, 613.

HPHY 613. Professional Skills III: Career Development. 1 Credit.
Development of professional skills for academic careers related to human physiology. Sequence with HPHY 611, 612.

HPHY 621. Systems Physiology I. 4 Credits.
Advanced overview of neural physiology, neural control of human movement, and the biomechanical constraints underlying that control. Sequence with 622, 623.

HPHY 622. Systems Physiology II. 4 Credits.
Advanced overview of cardiovascular physiology and skeletal muscle cell physiology and metabolism. Series with HPHY 621, 623.

HPHY 623. Systems Physiology III. 4 Credits.
Advanced overview of renal and respiratory physiology. Series with HPHY 621, 622.

HPHY 631. Human Performance and Sports Products. 3 Credits.
Exploration of sciences of human performance: physiology and kinesiology, which inform the Sports Product Industry at the level of product development, product design and marketing. Available to non-majors only.

HPHY 631M. Human Performance and Sports Products. 3 Credits.
Exploration of sciences of human performance: physiology and kinesiology, which inform the Sports Product Industry at the level of product development, product design and marketing. Multilisted with SPM 631M.

HPHY 632. Human Biomechanics and Sports Product Design. 2 Credits.
Exploration of sciences of human biomechanics, which inform the Sports Product Industry at the level of product development, product design and marketing.
Prereq: HPHY 631.

HPHY 660. Basic Science in Clinical Decisions. 4 Credits.
Literature-based investigation into the basic science and clinical research underlying clinical decisions in athletic medicine.

HPHY 661. Manual Therapy: Movement Patterns, Core Stability. 2 Credits.
Advanced skills in proprioceptive neuromuscular facilitation (PNF) movement patterns, and both pilates principles and manual therapy to improve core stability. For certified athletic trainers. Offered alternate years.

HPHY 662. Manual Therapy: Spine, Lower Quadrant. 2 Credits.
Advanced skills in muscle energy, mobilization, and trigger-point release techniques for the spine and lower quadrant. For certified athletic trainers. Offered alternate years.

HPHY 669. The Female Athlete. 4 Credits.
Literature-based investigation of the unique anatomy and physiology, as well as social-cultural issues, of the female athlete related to sports medicine.

HPHY 670. Advanced Respiratory Physiology. 4 Credits.
Explores advanced concepts in respiratory physiology; includes exercise adaptations and examples of pathophysiology. Offered alternate years.
Prereq: HPHY 623.

HPHY 671. Therapeutic Restoration of Biomotor Abilities. 3 Credits.
Exploration of advanced rehabilitation techniques for athletic trainers, including advanced program design, evaluation, and movement-sport analysis.
Pre- or coreq: certification as an athletic trainer or physical therapist.

HPHY 676. Human Cardiovascular Control. 4 Credits.
Cardiovascular physiology, including central control of blood pressure and flow regulation. An integrative approach toward how the cardiovascular system is coordinated with overall body function. Offered alternate years.
Prereq: HPHY 623.

HPHY 684. Kinematics of Human Movement. 4 Credits.
Theory and application of kinematic analysis of human motion. Emphasis on 2D and 3D kinematics, including data collection, analysis and modeling. Offered alternate years.
Prereq: HPHY 621.

HPHY 685. Kinetics of Human Movement. 4 Credits.
Experimental methods and mechanical theories associated with the analysis of joint forces and movements during human motion. Offered alternate years.
Prereq: HPHY 621.