

Health Physics

Chair

Madsen, Steen (1997), Associate Professor; B.S., University of Toronto; M.S., Ph.D., McMaster University.

Graduate Coordinator

Patton, Phillip (2000), Associate Professor; B.S., Augusta College; M.S., University of Georgia; M.S., Ph.D., University of Florida.

Graduate Faculty

Cheney, Marcos A. (2005), Assistant Professor; B.S., University of Baja California, Ensenada; M.S., Ph.D., University of California, Davis.

Hirschberg, Henry (2006), B.E.E. City University New York; M.D., Ph.D., University of Oslo, Norway.

Riland, Carson A. (1996); B.S. Bloomsburg University; M.S., Ph.D. Texas A&M University.

Sudowe, Ralf (2006), Assistant Professor; Dipl.-Chem, Dr. rer. nat., Philipps Universität Marburg, Germany.

Many industries, medical facilities, and research laboratories demand professionals who understand radiation hazards, their prevention and control. Prominent among scientists is the health physicist, who controls the beneficial use of ionizing radiation while protecting workers and the public from potential hazards. Our M.S. program provides students with instruction and research opportunities in the field of radiation protection with emphasis on environmental health physics, radioactive waste management, radiation dosimetry, medical physics, and medical health physics. The Department of Health Physics faculty look forward to working with prospective students in this challenging program of study.

Health physics is the profession dedicated to the protection of the individual, the population, and the environment from the potentially harmful effects of radiation. It incorporates the principles and technical skills from many disciplines: physics, chemistry, biochemistry, biology, mathematics, ecology, toxicology, and industrial hygiene. The wide spectrums of knowledge required of the health physicist make this profession both challenging and rewarding.

The Master of Science (M.S.) in Health Physics is designed to prepare students in the field of health physics to administer public and private radiation health programs; investigate medical uses of radioactivity; measure and control radiation in the workplace and the environment; ensure compliance with radiation protection regulations; assist in the cleanup of radioactive and hazardous waste sites; evaluate worker, patient, and public radiation doses; and conduct research in radiation protection.

The Program Educational Objectives for the M.S. in Health Physics Program are as follows:

1. Graduates will demonstrate competency in applying the theoretical and problem solving aspects of health physics and related disciplines.
2. Graduates will demonstrate competency in the practical applications of health physics.
3. Graduates will effectively communicate technical information in both oral and written form

4. Graduates will be competent in research methods and be able to critically review research with the intent of applying findings to their practice.
5. Graduates will be prepared to pursue a lifetime of selfdirected learning and professional development.
6. Graduates will conduct themselves in a professional and ethical manner.

Admission Requirements

Applications for admission may be obtained by contacting the Department of Health Physics or the Graduate College. Completed applications, official Graduate Record Examination (GRE) scores and one copy of official transcripts from all institutions attended after high school are submitted to the Graduate College. All other data (i.e., letters of recommendation and statement of professional goals) are submitted directly to the Department of Health Physics.

Students seeking admission to the graduate program in health physics must fulfill the following admission requirements:

1. Overall GPA of 3.00 (A=4.00 or equivalent) in undergraduate work. Applicants with a GPA below 3.00, but not less than 2.75, may be admitted as a graduate provisional student.
2. Successful completion (grade of C or better) of the following course work: a. Seven-semester credits in biology including an introductory modern biology course and one higher level course b. Ten-semester credits in chemistry or geology including a general chemistry sequence and one higher-level course c. Eight-semester credits in elementary calculus (mathematics through differential equations is recommended) d. Twelve-semester credits in physics including a general physics sequence e. A course in computer programming (an additional course in numerical methods or scientific computing is recommended)
Applicants not meeting a limited number (maximum of nine credit hours) of prerequisite requirements may still be admitted to the program. However, prerequisite requirements may still be admitted to the program. However, prerequisite deficiencies must be completed during the first year of study and prior to registering for HPS 796 or 797.
3. Completion of a baccalaureate degree in health physics, one of the basic sciences, or in a closely related scientific or engineering field. Applicants holding a degree in a non-related field may be given special consideration if they have completed all prerequisite course work.
4. A composite score of 1,000 or higher on the verbal and quantitative sections of the Graduate Record Exam (GRE).
5. Three letters of recommendation from former instructors or employers that speak to the applicant's potential as a graduate student. The individual writing the letter may use the form available from the Graduate College, which includes a release form for the student to sign.
6. A statement of approximately 300 words indicating the student's professional goals and reason for seeking graduate education.

- International applicants whose native language is not English must show competency in the English language before they can be admitted. A satisfactory score (minimum 550 on the written or 213 on the computerized version) on the "Test of English as a Foreign Language" (TOEFL) or comparable evidence of competency in English must be submitted by students as part of their application.

Progression

To progress in the program students must:

- Maintain a cumulative grade point average of 3.00 or above each semester enrolled.
- Receive a grade of B (3.00) or above in all core health physics courses. If less than a B is earned, the course may be repeated. The student must be in good standing to repeat a course, and any core course may be repeated only once.
- A student may register for a course only twice. A student who registered for the same core course twice and has received a grade less than B is ineligible for readmission unless unanimously approved by Health Physics Program graduate faculty.
- Complete a minimum of six semester hours in each calendar year.
- Continuously register for three credit hours of HPS 796 or HPS 797 each semester while working on the thesis or professional paper until completion.

Advisement

The Health Physics Graduate Program Director will serve as academic advisor to all entering students for program planning. At the time the student selects his/her examination committee, the committee chairperson becomes the student's official advisor.

Degree Requirements

Requirements for the Master of Science in Health Physics include completion of 37 semester hours in required and elective graduate courses. These requirements will be established in consultation with the student's advisor in accordance with the Department of Health Physics and Graduate College policy and shall include:

- Health Physics Core (22 credits): HPS 602, 603, 620, 701, 718, 720 and 791 (three times)
- Electives (9 credits): Graduate-level health physics or other approved graduate-level courses. It is recommended that electives include a statistics course and either the Environmental Health Physics or Medical Physics areas listed below: a. Environmental Health Physics: HPS 670, 680, 750 b. Medical Physics: HPS 740, 742 3. Completion of a thesis or professional paper (6 credits): HPS 796 or 797.

Graduation Requirements

Students in the M.S. in Health Physics Program must adhere to the following requirements for graduation:

- Residency Credits. A minimum of 20 credits exclusive of thesis or special topic project must be earned at UNLV. A minimum of 15 credits must be accumulated within

the School of Health and Human Sciences. Attendance at the University of Nevada, Reno does not interrupt, but does not contribute to, residency credits, because this institution is within the University and Community College System of Nevada.

- Credit by Challenge Examination. Graduate courses in the Health Physics program may not be challenged for credit.
- Six-year Completion Rule. All degree requirements must be completed within six calendar years from the date of matriculation. No credit may be used in an advanced degree program for course work completed more than six calendar years immediately preceding the term in which all degree requirements are completed.
- Allotment of Credits. Students have a choice of catalog under which they wish to graduate a) the year of official matriculation or b) the year of graduation. Students are encouraged to meet the requirements of the current catalog.
- A final oral examination will be held following completion of the thesis or professional paper resulting from a special topics project. The final examination must be held at least three weeks prior to the last day of instruction in the term in which the student plans to complete the degree requirements.

Health Physics

HPS 701

4 credits

Radiation Physics and Protection

Atomic and nuclear structure; decay energetics and kinetics; interactions of radiation with matter; radiation protection standards; practical aspects of radiation protection; photon, neutron, beta and X-ray shielding; criticality; radiation protection at reactors, accelerators and medical facilities; radioactive material transportation regulations. Prerequisites: BIOL 189, CHEM 122 and PHYS 182.

HPS 702

3 credits

Radiation Detection and Transport

Detection of ionizing radiation, counting statistics, and radiation transport modeling. Prerequisites: HPS 701, STA 161 or 491, or consent of instructor. Corequisite: HPS 718.

HPS 718

3 credits

Radiochemistry Laboratory

Laboratory experiments in radiation detection, counting statistics and radiochemical separations are discussed. The operation and calibration of alpha- and gamma-ray spectrometry equipment and liquid scintillation counters will be examined. Radiochemical separation and analysis of environmental samples are performed. Novel and standard procedures for sample examination will be covered. Corequisite: HPS 602. Prerequisite: Consent of instructor.

HPS 720 **Radiation Dosimetry** **3 credits**

Mathematical treatment of the fundamental principles of internal and external radiation dosimetry. Pathway models and bioassay techniques studied to support the calculation of radiation dose from the intake of radioactivity. General external dosimetry from a variety of industrial and medical sources is addressed. Prerequisites: HPS 701 or consent of instructor.

HPS 740 **Medical Imaging Physics** **3 credits**

Conceptual, mathematical, and diagnostic aspects of commonly used clinical imaging modalities including film-screen radiography, computed tomography, magnetic resonance imaging, single photon emission computed tomography, positron emission tomography, and ultrasound. Prerequisites: HPS 701 or consent of instructor.

HPS 740L **Diagnostic Medical Physics Clinical Rotation and Laboratory** **3 credits**

Covers the quality control and assurance aspects of commonly used clinical diagnostic modalities including film-screen and digital radiography, mammography, computed tomography, magnetic resonance imaging, single photon emission computed tomography (SPECT), and positron emission tomography (PET). Corequisite: HPS 740 or consent of instructor. Prerequisite: HPS 701.

HPS 742 **Radiation Therapy Physics** **3 credits**

Use of ionizing and nonionizing radiation in radiation therapy to cause controlled biological effects in cancer patients. Emphasis on external treatment techniques using photon and electron beams, internal treatment techniques, and treatment planning. Prerequisites: HPS 701 or consent of instructor.

HPS 750 **Radiation Risk Assessment** **3 credits**

Descriptive and mathematical treatment of radionuclide transport, bioaccumulation, and human uptake. Risk analyses based on recent epidemiological studies reviewed. Prerequisites: HPS 670 or consent of instructor.

HPS 760 **Environmental Restoration and Radioactive Waste Management** **3 credits**

Overview of the cleanup and management of radioactive and mixed wastes in the federal and private sector. Role of radiation protection personnel in radioactive waste management activities discussed. Prerequisites: HPS 701 or consent of instructor.

HPS 772 **Environmental Radiation Measurements** **3 credits**

Laboratory sessions provide practical experience with techniques to evaluate the presence of radioactivity in environmental media. Topics include environmental radiation sources, environmental monitoring plans, sample collection and analysis, in-situ gamma-ray spectrometry, data interpretation and laboratory quality control. One hour lecture and three hours laboratory. Prerequisites: HPS 670 and HPS 718 or consent of instructor.

HPS 781 **Industrial Hygiene II** **3 credits**

Overview of the major physical and biological hazards in the industrial environment emphasizing recognition, monitoring technology, engineering control methodology, and best practice. Prerequisites: HPS 680 or consent of instructor.

HPS 791 **Graduate Seminar** **1 credit**

Overview of research methods, ethics, professional development, and technical communications related to health physics. Students prepare and give seminars on topics of interest in health physics. May be repeated for a maximum of three credits.

HPS 795 **Independent Study** **1-3 credits**

Individual directed study of a topic in health physics not covered in depth in other courses. May be repeated to a maximum of six credits. Prerequisites: Graduate standing in health physics and consent of instructor.

HPS 796 **Professional Paper** **3 credits**

Discussion of the components of a research proposal, writing a research proposal, and conducting pilot projects. May be repeated but only six credits applied to the student's program. S/F grading only. Prerequisites: HPS 620, HPS 701, graduate standing in health physics, and consent of instructor.

HPS 797 **Thesis** **3 credits**

May be repeated but only six credits applied to the student's program. S/F grading only. Prerequisites: HPS 620, HPS 701, graduate standing in health physics, and consent of instructor.

The following courses have been approved for graduate credit. Full descriptions of these courses may be found in the *Undergraduate Catalog* under the corresponding 400 number.

- HPS 602 Radiation Detection
- HPS 603 Radiation Physics and Instrumentation Laboratory
- HPS 620 Radiation Biology
- HPS 670 Environmental Health Physics
- HPS 680 Industrial Hygiene

Health Sciences

HSC 777

3 credits

Advanced Applied Statistics for the Health Sciences

Application of advanced statistical procedures to the investigation of research problems in the health science professions. Emphasis on a conceptual understanding of selected advanced statistical techniques with application to the investigation and analysis of problems in the health sciences area. Prerequisites: Introductory course in statistics and introduction to research methodology course or consent of instructor.

Kinesiology

Chair

Mercer, John (1999), Associate Professor; B.S., Buffalo State College of New York; M.S., University of North Texas; Ph.D., University of Oregon.

Graduate Coordinator

Young, John C. (1991), Professor; B.S.Ed., M.S., University of Michigan; Ph.D., University of Wisconsin, Madison.

Graduate Admissions Coordinator

Wulf, Gabriele (2001), Professor; Diplom, Ph.D., Deutsche Sporthochschule Koln; Ph.D., University of Munich.

Graduate Faculty

Golding, Lawrence A. (1976), Distinguished Professor; B.S., M.S., Ph.D., University of Illinois.

Guadagnoli, Mark A. (1991), Professor; B.S., M.S., Texas A&M University; Ph.D., Auburn University.

Holcomb, William R. (2001), Associate Professor; B.S. Berry College; M.S. U.S. Sports Academy; Ph.D. Auburn University.

Mangus, Brent C. (1985), Associate Professor; B.S., Utah State University; M.S., University of Oregon; Ed.D., University of Utah.

Massengale, John D. (1986), Professor; B.S., Northwest Missouri State University; M.S., Illinois State University; Ed.D., University of New Mexico.

Rubley, Mack (2001), Assistant Professor; B.S., University of Colorado; M.S., University of Pennsylvania; Ph.D., Brigham Young University.

Tandy, Richard D. (1989), Associate Professor; B.S., Appalachian State University; M.S., Ph.D., Texas A&M University.

Kinesiology is the study of human movement as it relates to human performance. The graduate degrees offered by the Department of Kinesiology are designed to prepare students for advanced study in biomedical sciences, clinical positions, and leadership positions in instituting physical fitness programs in public and private organizations. The department is committed to an interdisciplinary approach to professional preparation and scholarship and to creating an environment in which both basic and applied research in the field of kinesiology is stimulated. Comprehensive laboratories have been developed for the study of human performance, injury rehabilitation, and skill acquisition.

Students are afforded the opportunity to work closely with faculty in all areas of academics and research. The faculty are recognized internationally through their scholarship and research and are enthusiastically committed to graduate education.

The Department of Kinesiology offers programs of study that lead to a Master of Science degree in Exercise Physiology or Kinesiology. These degree programs allow students a choice of preparation and opportunities to specialize in biomechanics, exercise physiology, motor learning/motor control and sports medicine. The goal of the graduate program in kinesiology is to provide students with the theory, knowledge, and skills necessary to apply the principles of human movement in a variety of community, research, clinical, or athletic settings, or to pursue advanced study at the doctoral level.