MEDICAL PHYSICS, PH.D.

One of the basic science departments of the UW–Madison School of Medicine and Public Health, the Department of Medical Physics offers comprehensive training in diagnostic and therapeutic medical physics and in health physics. Achievement of the M.S. or Ph.D. in this department reflects strong scholarship in one of the top medical physics programs in the United States. Graduates are prepared for teaching, research, and clinical physics positions in medical centers, national laboratories, and universities, and in the medical and nuclear technology industries.

Medical physicists may participate professionally in the radiation treatment of cancer patients, in advanced medical imaging and diagnostic procedures, or in related areas of research and teaching. Health physicists may operate radiation protection programs at nuclear industrial facilities, hospitals, or laboratories, or may perform research on methods of measuring ionizing radiations (i.e., dosimetry).

A unique quality of the medical physics program is the broad range of expertise and research interests of the faculty. Students receive training in diagnostic x-ray physics, x-ray computerized tomography, magnetic resonance imaging and spectroscopy, nuclear medicine and positron emission tomography (PET) imaging, biomagnetism, medical ultrasound, elastography, radiation dosimetry, radiation treatment planning, and radiobiology.

The Ph.D. is primarily a research degree that extends the student’s depth of knowledge in one of the specialty areas. Faculty positions at universities, research positions, and an increasing number of clinical physics positions require the Ph.D. degree. Medical physics faculty maintain close collaborative ties with faculty in other departments, including human oncology, radiology, cardiology, medicine, psychiatry, and pharmacology, broadening the scope of research opportunities open to medical physics students and providing access to sophisticated clinical facilities.

The department also houses the Medical Radiation Research Center and Accredited Dosimetry Calibration Laboratory, one of four in the U.S. accredited by the American Association of Physicists in Medicine. In addition, the department provides clinical support services to the radiology and human oncology departments. It also operates a PET radiotracer production facility, a medical image analysis laboratory, and a small bore MRI scanner in the medical school’s small animal imaging laboratory. Each of these facilities provides unique training and support for graduate students.

FUNDING

The department typically supports 85–90 percent of students enrolled in the medical physics graduate program through department or university fellowships, research or teaching assistantships, or NIH–NRSA traineeships. All awards include a comprehensive health insurance program and remission of tuition. The student is responsible for segregated fees.

REQUIREMENTS

MINIMUM DEGREE REQUIREMENTS AND SATISFACTORY PROGRESS

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirementstext) in addition to the requirements of the program.

DOCTORAL DEGREES

Ph.D.

MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT

54 credits

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT

42 credits

MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT

Seventy-five percent of degree coursework (40 credits out of 54 total credits) must be in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

PRIOR COURSEWORK REQUIREMENTS: GRADUATE WORK FROM OTHER INSTITUTIONS

With program approval, students are allowed to count no more than 12 credits of medical physics graduate coursework from other institutions. Coursework earned five years or more prior to admission to the doctoral degree program is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNDERGRADUATE

With program approval, 7 credits in medical physics courses from a UW–Madison undergraduate degree above the undergraduate graduation requirements are allowed to count toward the degree.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNIVERSITY SPECIAL

With program approval, students are allowed to count no more than 15 credits of coursework numbered 500 or above taken as a UW–Madison Special student. Coursework earned five years or more prior to admission to the doctoral degree program is not allowed to satisfy requirements.

CREDITS PER TERM ALLOWED

15 credits

PROGRAM-SPECIFIC COURSES REQUIRED

Completion of the core and elective course requirements as defined for the master’s degree is required. See the master’s degree specific courses section of this table.
DOCTORAL MINOR/BREADTH REQUIREMENTS
The 54 credits needed to satisfy the Ph.D. degree requirement must include 9 credits of graduate-level courses (greater than and including 300 level) constituting a minor subject area, consisting of a coherent body of work complementary to the candidate’s research. The objective of the minor course requirement is to add a defined breadth to the candidate’s education. Please see the Medical Physics Graduate Student Handbook (https://www.medphysics.wisc.edu/graduate) for more information regarding minor options.

OVERALL GRADUATE GPA REQUIREMENT
3.00 GPA required

OTHER GRADE REQUIREMENTS
See Medical Physics Graduate Student Handbook (http://www.medphysics.wisc.edu/graduate/documents/handbook_june_2014.pdf) on department criteria for satisfactory academic progress.

PROBATION POLICY
See Medical Physics Graduate Student Handbook (http://www.medphysics.wisc.edu/graduate/documents/handbook_june_2014.pdf) for more information.

ADVISOR / COMMITTEE
Candidates must acquire a major professor/advisor by the beginning of the second semester of study.

See Medical Physics Graduate Student Handbook (http://www.medphysics.wisc.edu/graduate/documents/handbook_june_2014.pdf) for department criteria for doctoral committee.

ASSESSMENTS AND EXAMINATIONS
The qualifying examination should be taken by the end of the second year. Students should complete the preliminary examination by the end of the third year. Permission from the graduate committee and department chair is required if the exam needs to be taken after the third year. Defense of a dissertation is required within five years of successful completion of the preliminary examination.

TIME CONSTRAINTS
The qualifying examination should be taken by the end of the second year. Students should complete their preliminary examination by the end of the third year. Permission from the graduate committee and department chair is required if the exam needs to be taken after the third year. Defense of a dissertation is required within five years of successful completion of the preliminary examination.

LANGUAGE REQUIREMENTS
No language requirements.

ADMISSIONS
About 150 applicants per year are attracted to the medical physics program. Each fall the program admits 15–20 students based on academic record. This results in an average enrollment of approximately 100 students each semester. Less than one-fourth of the students pursue the M.S. degree as a terminal degree, and the remainder continue on to the Ph.D.

A bachelor’s degree in physics is considered the best preparation for graduate study in medical physics, but majors such as nuclear engineering, biomedical engineering, electrical engineering, or chemistry may also be acceptable. The student’s math background should include calculus, differential equations, linear algebra, and Fourier analysis, such as might be learned in modern optics or undergraduate quantum theory. Some facility in computer programming and electronic instrumentation is desirable. One year of chemistry, a year of biology, and an introductory course in physiology are also advantageous.

Beginning graduate students should start their studies in the fall semester, as the course sequence is based on that assumption. Students applying for admission should submit an online application and all supporting documentation by December 1 (for domestic applications; international applications are due November 15), to ensure consideration for admission and financial support to begin the following fall.

Admission to the graduate program is competitive. Applications are judged on the basis of a student’s previous academic record, Graduate Record Exam (GRE) scores, research experience, letters of recommendation, and personal statement of reasons for interest in graduate study in medical physics.

The application process is in two parts:

1. Complete the online application to the Graduate School and pay application fee.
2. Provide electronic copies of resume (include awards, fellowships, and scholarships received, publications, volunteer activities, and research experience); the “applicant data sheet”; personal statement of reasons for interest in graduate study in medical physics; and mail two official sets of paper transcripts to the department. Note: Recommendation letters are submitted electronically through the online application. To report Graduate Record Exam (GRE) scores, use Institution Code 1846 for the University of Wisconsin–Madison.

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS
• Articulates research problems, potentials, and limits with respect to theory, knowledge, or practice within the field of medical physics.
• Formulates ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the field of medical physics.
• Creates research, scholarship, or performance that makes a substantive scientific contribution.
• Demonstrates breadth within their learning experiences.
• Advances contributions of the field of medical physics to society.
• Communicates complex ideas in a clear and understandable manner in both oral and written formats.

PROFESSIONAL CONDUCT
• Fosters ethical and professional conduct.

PEOPLE
Faculty: Professors Jackson (chair), Alexander, Bayouth, Block, Campagnola, Chen, Christian, DeJesus, DeWerd, Fain, Grist, Hall, Henderson, Jeraj, Korosec, Meyerand, Peppler, Reeder, Thomadsen, Varghese, Wakai; Associate Professors Brace, Cai, Emborg, Ranallo,
Vetter, Weichert, Wieben; Assistant Professors Bednarz, Birn, Culberson, Kissick, Li, Nagle, Prabhakaran, Smilowitz, Speidel; Emeritus Professors DeLuca, Holden, Mackie, Madsen, Mistretta, Nickles, Paliwal, Van Lysel, Zagzebski