The department offers the master of arts and master of science degrees in physics, and the doctor of philosophy degree with a major in physics.

The master of arts degree is a purely academic degree, requiring 30 credits of graduate work and passage of the qualifying examination at the master’s level. It is designed to strengthen the student’s physics background and enhance the opportunities for employment as a physicist or in physics education.

The master of science degree is a professional program that requires the completion of a directed master’s project and thesis in the student’s area of interest, 30 credits of graduate work, and passage of the qualifying examination at the master’s level. It is designed to strengthen the student’s background and experience in physics, and enhance the opportunities for employment as a physicist or in physics education.

The Ph.D. degree requires successful completion of advanced course work in physics, completion of a minor, and passage of the qualifying and preliminary examinations. However, the Ph.D. is primarily a research degree, awarded only upon completion of substantial original research in some subfield of physics. The program provides the background, experience, and credentials needed for employment as a professional physicist in research or education.

The research program in physics is unusually broad in scope with active experimental and theoretical research programs in astrophysics; atomic, molecular, and optical physics; biophysics; condensed matter physics; elementary particle physics; nuclear physics; particle physics theory; phenomenology; and plasma physics. This broad range of research opportunities makes the department especially attractive to beginning students who have not yet chosen a field of specialization.

Research specialties include:

**THEORETICAL PHYSICS**
- Astrophysics; atomic, molecular, and optical physics; condensed matter physics; cosmology; elementary particle physics; nuclear physics; phenomenology; plasmas and fusion; quantum computing; statistical and thermal physics; string theory.

**EXPERIMENTAL PHYSICS**
- Astrophysics; atomic, molecular, and optical physics; biophysics; condensed matter physics; cosmology; elementary particle physics; neutrino physics; experimental studies of superconductors; medical physics; nuclear physics; plasma physics; quantum computing; spectroscopy.

The Department of Physics has a diverse group of graduate students who come from many countries around the world. There are typically 150–200 graduate students in the department. Virtually all students admitted receive financial support in the form of teaching or research assistantships and fellowships.

The information on courses and examinations provided in this catalog is only a brief summary of the procedures for graduate work in the department. Entering graduate candidates are supplied with additional details when they arrive. More complete information on the graduate program, the faculty, and research groups is available at the department website (http://www.physics.wisc.edu).

### 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.

#### MASTER’S DEGREES

**M.A., M.S.**

**MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT**

30 credits

**MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT**

30 credits

**MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT**

Half of degree coursework (15 of total 30 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). No 300-level courses will be counted toward the 30 credit minimum.

**PRIOR COURSEWORK REQUIREMENTS: GRADUATE WORK FROM OTHER INSTITUTIONS**

No coursework from other institution may count toward any graduate degree in physics.

**PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNDERGRADUATE**

Up to 7 credits in courses numbered 500 or above may be used to satisfy minimum degree requirements.

**PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNIVERSITY SPECIAL**

With program approval and payment of difference in tuition (between Special and graduate tuition), students are allowed to count no more than 15 credits of coursework numbered 500 or above taken as a UW–Madison University Special student. Coursework earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

**CREDITS PER TERM ALLOWED**

15 credits

**PROGRAM-SPECIFIC COURSES REQUIRED**

Contact the program for information on any additional required courses.

**OVERALL GRADUATE GPA REQUIREMENT**

3.00
OTHER GRADE REQUIREMENTS
The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.

PROBATION POLICY
The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

ADVISOR / COMMITTEE
Every graduate student is required to have an advisor. To ensure that students are making satisfactory progress toward a degree, the Graduate School expects them to meet with their advisor on a regular basis.

An advisor generally serves as the thesis advisor. In many cases, an advisor is assigned to incoming students. Students can be suspended from the Graduate School if they do not have an advisor. An advisor is a faculty member, or sometimes a committee, from the major department responsible for providing advice regarding graduate studies.

A committee often accomplishes advising for the students in the early stages of their studies.

ASSESSMENT AND EXAMINATIONS
Contact the program for information on required assessments and examinations.

TIME CONSTRAINTS
Master’s degree students who have been absent for five or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

LANGUAGE REQUIREMENTS
Contact the program for information on any language requirements.

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS
• Mastery of the core physical concepts (classical mechanics, electricity and magnetism, quantum mechanics, and statistical mechanics).
• Articulates, critiques, or elaborates the theories, research methods, and approaches to inquiry or schools of practice in physics.
• Identifies sources and assembles evidence pertaining to questions or challenges in physics.
• Demonstrates understanding of the physics in an historical, social, or global context.
• Selects and/or utilizes the most appropriate methodologies and practices.
• Evaluates or synthesizes information pertaining to questions or challenges in physics.
• Communicates clearly in ways appropriate to the field of physics.

PROFESSIONAL CONDUCT
• Recognizes and applies principles of ethical and professional conduct.

PEOPLE
Faculty: Professors Karle (chair), D. Anderson, Balantekin, Barger, Boldyrev, Carlsmith, Chung, Coppersmith, Dasu, Eom, Eriksson, Everett, Forest, Gilbert, Halzen, Hanson, Hashimoto, Hegna, Heinz, Herndon, Joynt, Lagally, Lawler, Lazarian, Lin, McCammon, McDermott, Onellion, Rzchowski, Saffman, Sarff, Shiu, W. Smith, Sovinec, Terry, Timbie, Vavilov, Walker, Westerhoff, Winokur, Wu, Yavuz, Zweibel; Associate Professors Egedal, Pan; Assistant Professors Arnold, Bai, Levchenko, Palladino, Vandenbroucke

ADMISSIONS
Admission is competitive. All applicants are reviewed and evaluated on the basis of previous academic record, three letters of recommendation, statement of purpose for graduate studies, resume, and Graduate Record Exam (GRE) general and subject scores. The physics subject GRE exam is required. For applicants whose native language is not English, the department requires a minimum score of 580 (paper-based), 237 (computer-based) or 92 (internet-based) on the Test of English as a Foreign Language (TOEFL) exam, or 7 on the International English Language Testing System (IELTS) exam. All eligible applicants with complete files are considered for teaching or research assistantships and fellowships. To be considered for admission, students must submit all application materials (including test scores) via the Graduate School electronic application site (https://www.gradsch.wisc.edu/eapp/eapp.pl) by December 15.