PHYSICS: RESEARCH, M.S.

This is a named option within the Physics M.S (http://guide.wisc.edu/graduate/physics/physics-ms/). The master of science research degree program in physics requires the completion of a directed master’s project and thesis in the student’s area of interest, 30 credits of graduate work (including the core course requirements), 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 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.

ADMISSIONS

The M.S.-Research option is offered for work leading to the Ph.D. Students may not apply directly for the master’s, and should instead see the admissions information for the Ph.D (https://guide.wisc.edu/graduate/physics/physics-phd/). (https://guide.wisc.edu/graduate/physics/physics-phd/#admissionstext)

Students may also apply to the M.S. named option in Quantum Computing. (https://guide.wisc.edu/graduate/physics/physics-ms/physics-quantum-computing-ms/)

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding/) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/policiesandrequirements/text), in addition to the program requirements listed below.

NAMED OPTION REQUIREMENTS

**MODE OF INSTRUCTION**

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

**Accelerated:** Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

**Evening/Weekend:** Courses meet on the UW-Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

**Face-to-Face:** Courses typically meet during weekdays on the UW-Madison Campus.

**Hybrid:** These programs combine face-to-face and online learning formats. Contact the program for more specific information.

**Online:** These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Credit Requirement</td>
<td>30 credits</td>
</tr>
<tr>
<td>Minimum Residence Credit Requirement</td>
<td>30 credits</td>
</tr>
<tr>
<td>Minimum Graduate Coursework Requirement</td>
<td>Half of degree coursework (15 credits out of 30 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide (<a href="https://registrar.wisc.edu/course-guide/">https://registrar.wisc.edu/course-guide/</a>). No 300-level courses will be counted toward the 30 credit minimum.</td>
</tr>
<tr>
<td>Overall Graduate GPA Requirement</td>
<td>3.00 GPA required.</td>
</tr>
</tbody>
</table>
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.

Assessments and Examinations
All master of science degree candidates must pass the qualifying examination at the master’s level.
Master of science degree candidates must write a master’s thesis and defend that thesis in a seminar.

Language Requirements
Contact the program for information on any language requirements.

REQUIRED COURSES
All graduate degree candidates are required to take five core courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS 711</td>
<td>Theoretical Physics-Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 715</td>
<td>Statistical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 721</td>
<td>Theoretical Physics-Electrodynamics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 731</td>
<td>Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 732</td>
<td>Quantum Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>

The remaining 15 credits may be earned through a combination of research and coursework, to be determined by the advisor in consultation with the student.

POLICIES

GRADUATE SCHOOL POLICIES
The Graduate School’s Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy/) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

NAMED OPTION-SPECIFIC POLICIES

PRIOR COURSEWORK
Graduate Work from Other Institutions
Prior coursework from other institution may count toward any graduate degree in physics as allowed by the Graduate School policy on prior coursework.

UW–Madison Undergraduate
Up to 7 credits in courses numbered 500 or above may be used to satisfy minimum degree 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.

PROBATION
Grade of B or better in all coursework and a minimum cumulative graduate GPA of 3.0 are required.

ADVISOR / COMMITTEE
All students are assigned a temporary advisor upon matriculation. The responsibility to acquire (choose and be accepted by) a major professor (permanent advisor) is entirely with the student. Acceptance for M.S. research by a professor depends on the professor’s appraisal of the student’s potential for research and on the ability of the professor to accept a student at that time. Usually the major professor will be able to offer support in the form of a research assistantship, but this is not always the case, and occasionally a student may need to work as a teaching assistant while performing thesis research.

Graduate students should begin research work as early as possible. Students are encouraged to acquire a major professor (advisor) and begin research by the end of the second semester. Students who do not acquire a research advisor and begin research by the end of their third semester may be dropped from the program.

All M.S. candidates are required to write a master’s thesis and present their research in a seminar. All master’s theses must be approved a committee comprised of the student’s advisor and two other members, at least one additional faculty member.

CREDITS PER TERM ALLOWED
15 credits

TIME CONSTRAINTS
n/a

GRIEVANCES AND APPEALS
These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (https://doso.students.wisc.edu/bias-or-hate-reporting/)
- Graduate Assistantship Policies and Procedures (https://hr.wisc.edu/policies/gapp/#grievance-procedure)
- Hostile and Intimidating Behavior Policies and Procedures (https://hr.wisc.edu/hib/)
  - Office of the Provost for Faculty and Staff Affairs (https://facstaff.provost.wisc.edu/)
  - Dean of Students Office (https://doso.students.wisc.edu/) (for all students to seek grievance assistance and support)
- Employee Assistance (http://www.eao.wisc.edu/) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (https://employeedisabilities.wisc.edu/) (for qualified employees or applicants with disabilities to have equal employment opportunities)
- Graduate School (https://grad.wisc.edu/) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (https://compliance.wisc.edu/) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (https://conduct.students.wisc.edu/) (for conflicts involving students)
• Ombuds Office for Faculty and Staff (http://www.ombuds.wisc.edu/) (for employed graduate students and post-docs, as well as faculty and staff)
• Title IX (https://compliance.wisc.edu/titleix/) (for concerns about discrimination)

Students should contact the department chair or program director with questions about grievances. They may also contact the L&S Academic Divisional Associate Deans, the L&S Associate Dean for Teaching and Learning Administration, or the L&S Director of Human Resources.

OTHER
n/a

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School’s professional development resources (https://grad.wisc.edu/pd/) to build skills, thrive academically, and launch your career.

PROGRAM RESOURCES

Students are encouraged to attend Graduate School sponsored Professional Development events and participate in Graduate School Professional Development resources, such as the Individual Development Plan (IDP).

PEOPLE

FACULTY

More detail about each faculty member (https://www.physics.wisc.edu/people/faculty/) and the research areas (https://www.physics.wisc.edu/research/areas/) can be found on the Physics website.

Yang Bai, Professor
Baha Balantekin, Eugene P. Wigner Professor
Vernon Barger, Van Vleck Professor and Vilas Research Professor
Keith Bechtol, Associate Professor
Kevin Black, Professor
Stanislav Boldyrev, Professor
Uwe Bergmann, Martin L. Pearl Professor in Ultrafast X-Ray Science
Tulika Bose, Professor
Victor Brar, Van Vleck Associate Professor
Duncan Carlsmith, Professor
Daniel Chung, Professor
Susan Coppersmith, Emeritus Robert E. Fassnacht Professor and Vilas Research Professor
Kyle Cranmer, Professor & Data Science Institute Director
Sridhara Dasu, Professor
Jan Egedal, Professor
Mark Eriksson, John Bardeen Professor and Department Chair
Ilya Esterlis, Assistant Professor
Lisa Everett, Professor
Ke Fang, Assistant Professor
Cary Forest, Prager Professor of Experimental Physics
Pupa Gilbert, Vilas Distinguished Achievement Professor
Francis Halzen, Gregory Breit Professor, Hilldale Professor, & Vilas Research Professor
Kael Hanson, Professor
Aki Hashimoto, Professor
Matthew Herndon, Professor
Robert Joynt, Emeritus Professor
Albrecht Karle, Professor
Roman Kuzmin, Dunson Cheng Assistant Professor
Alex Levchenko, Professor
Lu Lu (aka Lu Lu), Assistant Professor
Dan McCammon, Professor
Robert McDermott, Professor
Moritz Muenchmeyer, Assistant Professor
Yibin Pan, Associate Professor
Brian Rebel, Professor
Mark Rzchowski, Associate Chair and Professor
Mark Saffman, Professor
John Sarff, Professor
Gary Shiu, Professor
Paul Terry, Professor
Peter Timbie, Professor
Justin Vandenbroucke, Associate Professor
Maxim Vavilov, Professor
Thad Walker, Vilas Distinguished Achievement Professor
Sau Lan Wu, Enrico Fermi Professor, Hilldale Professor, and Vilas Research Professor
Deniz Yavuz, Professor
Ellen Zweibel, William L Kraushaar Professor of Astronomy & Physics

AFFILIATED FACULTY

David Anderson, Professor, Electrical & Computer Engineering
Paul Campagnola, Professor, Biomedical Engineering
Jennifer Choy, Assistant Professor, Engineering Physics
Elena D’Onghia, Professor, Astronomy
Chang-Beom Eom, Professor, Materials Science & Engineering
Chris Hegna, Professor, Engineering Physics
Sebastian Heinz, Professor, Astronomy
Mikhail Kats, Associate Professor, Electrical & Computer Engineering
Jason Kawasaki, Associate Professor, Materials Science & Engineering
Irena Knezevic, Professor, Electrical & Computer Engineering
Alexandre Lazarian, Professor, Astronomy
Daniel Rhodes, Assistant Professor, Materials Science & Engineering
Oliver Schmitz, Professor, Engineering Physics
Micheline Soley, Assistant Professor, Chemistry
Carl Sovinec, Professor, Engineering Physics
Richard Townsend, Professor, Astronomy
Ying Wang, Assistant Professor, Materials Science & Engineering
Jun Xiao, Assistant Professor, Materials Science & Engineering