PHYSICS: QUANTUM COMPUTING, MS

This is a named option in the Physics MS. (http://guide.wisc.edu/graduate/physics/physics-ms/)

The MS in Physics–Quantum Computing (MSPQC) is an intensive professional master's degree designed to provide flexibility to students. It can be completed in one calendar year (three semesters) or it can take up to six semesters on a part-time basis. The program provides students with a thorough grounding in the discipline of quantum information and quantum computing. It begins with a study of the relevant parts of quantum theory, and proceeds to quantum gates, measurements, algorithms, quantum error correction, and decoherence. Quantum communication theory and the secure transmission of information are also covered. The supporting areas of statistical mechanics, solid-state physics, and atomic physics form part of the classroom training. Just as important, the program gives students a mastery of advanced lab skills involved in quantum computation and participation in mentored research projects is required.

Students who graduate from this program will have the tools to succeed as researchers or program managers in a quantum computing or quantum technologies enterprise. They may also use the program as a springboard to PhD programs in physics or related areas. MSPQC students interested in applying to the PhD at UW–Madison must adhere to all PhD admission requirements and deadlines.

ADMISSIONS

ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. ***Applicants must meet* the minimum requirements *(https://grad.wisc.edu/apply/requirements/) of the Graduate School as well as the program(s).*** Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/apply/).

Requirements	Detail
Fall Deadline	March 15
Spring Deadline	The program does not admit in the spring.
Summer Deadline	The program does not admit in the summer.
GRE (Graduate Record Examinations)	GRE General Test not required. GRE Physics Subject Test not required.
English Proficiency Test	Every applicant whose native language is not English, or whose undergraduate instruction was not exclusively in English, must provide an English proficiency test score earned within two years of the anticipated term of enrollment. Refer to the Graduate School: Minimum Requirements for Admission policy: https://policy.wisc.edu/library/UW-1241 (https://policy.wisc.edu/library/UW-1241/).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	3

For more details about the MS in Physics-Quantum Computing, visit the FAQ page.

* Current UW-Madison undergraduate and graduate students who graduate in the preceding fall semester may be eligible to apply for spring semester. Applicants should reach out to the MSPQC Graduate Program Manager for more information.

FUNDING

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.

PROGRAM INFORMATION

Students enrolled in this program are not eligible to receive tuition remission from graduate assistantship appointments at this institution.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

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

NAMED OPTION REQUIREMENTS

MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

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

Requirement	Detail
Minimum Credit Requirement	30 credits
Minimum Residence Credit Requirement	16 credits
Minimum Graduate Coursework Requirement	15 credits must be graduate-level coursework. Refer to the Graduate School: Minimum Graduate Coursework (50%) Requirement policy: https://policy.wisc.edu/library/UW-1244 (https://policy.wisc.edu/library/UW-1244/).
Overall Graduate GPA Requirement	3.00 GPA required. Refer to the Graduate School: Grade Point Average (GPA) Requirement policy: https://policy.wisc.edu/library/UW-1203 (https://policy.wisc.edu/library/UW-1203/).
Other Grade Requirements	n/a
Assessments and Examinations	n/a
Language Requirements	n/a

REQUIRED COURSES

Code	Title	Credits
Fall		
PHYSICS 701	Graduate Introductory Seminars	1
PHYSICS 709	Introduction to Quantum Computing	3
PHYSICS 531	Introduction to Quantum Mechanics	3
or PHYSICS 731	Quantum Mechanics	
or PHYSICS 448	Atomic and Quantum Physics	
or PHYSICS 545	Introduction to Atomic Structure	
PHYSICS elective: Any PHYSICS course numbered 300 or above.		3
PHYSICS or other elective: Any PHYSICS course numbered 300 or above; courses outside of PHYSICS must be approved by the MS Physics-Quantum Computing program.		3
Spring		
PHYSICS 779	Advanced Quantum Computing	3
PHYSICS 551	Solid State Physics	3
or PHYSICS 751	Advanced Solid State Physics	
or PHYSICS 449	Atomic and Quantum Physics	
or PHYSICS 732	Quantum Mechanics	
PHYSICS or other elective: Any PHYSICS course numbered 300 or above; courses outside of PHYSICS must be approved by the MS Physics-Quantum Computing program.		6
Summer		
PHYSICS 707	Quantum Computing Laboratory	4
PHYSICS 799	Independent Study	1
Total Credits		**30**

Students in this program may not take courses outside the prescribed curriculum without faculty advisor and program director approval. Students in this program cannot enroll concurrently in other undergraduate or graduate degree programs.

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 Credits Earned at Other Institutions

Refer to the Graduate School: Transfer Credits for Prior Coursework (https://policy.wisc.edu/library/UW-1216/) policy.

Undergraduate Credits Earned at Other Institutions or UW-Madison

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

Credits Earned as a Professional Student at UW-Madison (Law, Medicine, Pharmacy, and Veterinary careers)

Refer to the Graduate School: Transfer Credits for Prior Coursework (https://policy.wisc.edu/library/UW-1216/) policy.

Credits Earned as a University Special student at UW–Madison

With program approval, students are allowed to transfer no more than 9 credits of coursework numbered 500 or above taken as a UW–Madison University Special student. Coursework earned ten or more years prior to admission to a master's degree is not allowed to satisfy requirements.

PROBATION

Refer to the Graduate School: Probation (https://policy.wisc.edu/library/UW-1217/) policy.

ADVISOR / COMMITTEE

All students will be assigned a faculty advisor upon matriculation.

CREDITS PER TERM ALLOWED

15 credits

TIME LIMITS

Refer to the Graduate School: Time Limits (https://policy.wisc.edu/library/UW-1221/) policy.

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/)
- 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 Student Assistance and Support (OSAS) (https://osas.wisc.edu/) (for all students to seek grievance assistance and support)
- 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

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GRADUATE SCHOOL RESOURCES

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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). The MSPQC program is affiliated with the Wisconsin Quantum Institute (WQI) (https://wqi.wisc.edu), the home for quantum science and engineering at UW-Madison. Students also have access to professional development opportunities through UW–Madison's membership in the Chicago Quantum Exchange (https://chicagoquantum.org/), the National Science Foundation's Quantum Leap Challenge Institute, HQAN (https://news.wisc.edu/uw-madison-named-member-of-new-25-million-midwest-quantum-science-institute/), and the Department of Energy's Q-NEXT Center (https://q-next.org/).

PEOPLE

PEOPLE

MS IN PHYSICS - QUANTUM COMPUTING

A comprehensive list of faculty (https://wqi.wisc.edu/faculty/) involved in relevant research from all departments can be found on the Wisconsin Quantum Institute (https://wqi.wisc.edu/) website.

QUANTUM COMPUTING PHYSICS FACULTY

A.B. Balantekin, Eugene P. Wigner Professor
Victor Brar, Van Vleck Associate Professor
Mark Eriksson, John Bardeen Professor of Physics
Ilya Esterlis, Assistant Professor
Mark Friesen, Distinguished Scientist
Elio Konig, Assistant Professor
Roman Kuzmin, Dunson Cheng Assistant Professor of Physics
Alex Levchenko, Professor
Robert McDermott, Roeske Professor of Physics
Matthew Otten, Assistant Professor
Mark Saffman, Johannes Rydberg Professor
Tiancheng Song, Assistant Professor
Maxim Vavilov, Professor
Thad Walker, Vilas Distinguished Achievement Professor
Benjamin Woods, Assistant Professor
Deniz Yavuz, Professor, MSPQC Director

QUANTUM COMPUTING ADMINISTRATION

The MSPQC Program Director, Committee, and Administration can be found on the MSPQC program (https://www.physics.wisc.edu/graduate/mspqc-current-students/mspqc-faculty/) page.