MSPQC PROGRAM HANDBOOK 2025-2026

MS in Physics
Quantum Computing

DEPARTMENT OF PHYSICS
UNIVERSITY OF WISCONSIN–MADISON

Contents

WELCOME AND OVERVIEW

Alice, Katerina and Deniz would like to welcome you to the Masters of Science in Physics-Quantum Computing (MSPQC) program!

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The program provides students with a thorough grounding in the new discipline of quantum information and quantum computing. In the classroom, students will study the relevant parts of quantum theory, and proceed to quantum gates, measurements, algorithms, quantum error correction and decoherence. Quantum communication theory and the secure transmission of information will also be covered. The supporting areas of statistical mechanics, solid-state physics and atomic physics will form part of the classroom training. Just as important, the program will give students a mastery of the advanced lab skills involved in quantum computation. After graduation, students will have the tools to succeed as researchers or program managers in a quantum computing or quantum technologies enterprise. Students may also use the program as a springboard to Ph.D. programs in physics or related areas.

Each MSPQC student is assigned a faculty advisor for matters related to course selection, specific course content, and research opportunities relevant to quantum computing. This typically occurs by end of May prior to the start of the program. The Graduate Advisor will send one email to the faculty advisor and student/advisee to introduce them and prompt an initial meeting. Once the student selects a research direction or group, they will also be assigned a research advisor. This typically occurs towards the end of the first semester.

The Graduate Advisor is the first point-of-contact for all matters related to enrolling as a graduate student at UW, arriving in the U.S., compliance with policies and procedures, etc.

New graduate students can begin enrolling in fall classes in June. It's important that the student and faculty advisor have an initial in-person or virtual meeting to discuss first semester course enrollment by the end of June.

In addition to access to academic advising from an assigned faculty advisor and the Graduate Advisor, MSPQC students also receive career support and advising from the Associate Director of the MSPQC Program.

FACULTY ADVISOR

Students work with their assigned faculty advisor to:

- Select elective courses each semester
- Tailor course selection and academic plan to the needs of the individual based on the interests and academic preparation of each student
- Discuss research opportunities and help connect to research opportunities

MSPQC ASSOCIATE DIRECTOR

MSPQC program students should go to the Associate Director with questions related to:

- WQI research
- Professional Development
- Internship preparation and search
- Connection to industry partners
- Career goals

MSPQC GRADUATE ADVISOR

The MSPQC Graduate Advisor is the first point-of-contact for MSPQC program students. Students should talk with the MSPQC Graduate Advisor about questions related to:

- Program policies
- UW-Madison Campus policies (ex: minimum enrollment requirement)
- ISS policies/procedures (ex: CPT requests)
- Department policies
- Program requirements (ex: required courses, course waivers/substitutions)
- Connecting to campus resources
- Issues that have an impact on their studies and experience as a student

MSPQC ACADEMIC PRORAM POLICIES

COURSE POLICY

The MSPQC Program consists of 30 total credits. Of those 30 credits, 21 credits are for required core and core elective courses. This allows for students to select 9 credits (approximately 3 courses) of elective coursework to tailor the program to their particular academic and career interests and goals. All students and faculty advisors are provided with a Course Planning spreadsheet prior to the start of classes that help coordinate required and general elective course work. If you have not received such spreadsheet, please consult with the Graduate Advisor.

The MSPQC Program requires ALL of the following core courses (listed in increasing number):

- PHYSICS 701: Graduate Introductory Seminar (1 credit) – offered in the Fall
- PHYSICS 707: Quantum Computing Laboratory (4 credits) – offered in the Summer and Fall (for cont. students)
- PHYSICS 709: Introduction to Quantum Computing (3 credits) – offered in the Fall
- PHYSICS 763: Qubit Tune-Up and Programming (3 credits) – offered in the Fall
- PHYSICS 779: Advanced Quantum Computing (3 credits) – offered in the Spring
- PHYSICS 799: Independent Study (1 credit) – up to 3 credits can be declared in PHYSICS 799

The MSPQC Program requires AT LEAST TWO of the following **core elective courses** (courses are listed by semester in increasing number):

- PHYSICS 448: Atomic and Quantum Physics (3 credits) – offered in Fall
- PHYSICS 531: Introduction to Quantum Mechanics (3 credits) – offered in Fall and Spring
- PHYSICS 731: Quantum Mechanics (3 credits) – offered in Fall
- PHYSICS 449: Atomic and Quantum Physics (3 credits) – offered in Spring
- PHYSICS 545: Introduction to Atomic Structure (3 credits) – offered in Spring
- PHYSICS 551: Solid State Physics (3 credits) – offered in Fall and Spring
- PHYSICS 732: Quantum Mechanics (3 credits) – offered in Spring

The following are general guidelines in course-selection regarding the **core elective** courses:

- Students without any prior coursework in Quantum Mechanics are encouraged to take the PHYS 448/449 sequence
- Students with some prior coursework in Quantum Mechanics who may need a refresher are encouraged to take PHYS 531
- Students with substantial prior coursework in Quantum Mechanics are encouraged to take PHYISICS 731/732
- PHYS 545 can be taken concurrently with the other introductory or advanced courses in Quantum Mechanics and is a great course for students that are interested in the AMO side of Quantum.
- PHYS 551 can be taken concurrently with the other introductory or advanced courses in Quantum Mechanics and is a great course for students interested in Solid State Physics.

The MSPQC program does not offer official specialization tracks but a student can select **advising pathways** to develop skills aligned with their academic and career goals. That can be achieved via the **elective courses** and the independent study. There are two main advising pathways: Software and Hardware. Within the Software advising pathway a student can choose to further develop research-ready or industry-ready skills. Within the Hardware advising pathway a student can choose to develop skills aimed at AMO Physics or Solid-State Physics.

The following courses are recommended for the **Software pathway**:

- PHYSICS 765: Quantum Algorithms and Error Correction (3 credits) – offered in the Spring and is **strongly recommended**
- CS 412: Introduction to Numerical Methods – research-oriented skills
- CS 759: High Performance Computing for Applications in Engineering – research-oriented skills
- CS 319: Data Science Programming I for Research – industry-oriented skills
- CS 506: Software Engineering – industry-oriented skills

The following courses are recommended for the **Hardware pathway with AMO focus**:

- PHYSICS 623: Electronic Aids to Measurement – offered in the Spring and is **strongly recommended**
- PHYSICS 625: Applied Optics – offered in the Fall and is **strongly recommended**
- ECE 835: Light Interactions with Quantum Materials

The following courses are recommended for the **Hardware pathway with Solid-State Physics focus**:

- PHYSICS 623: Electronic Aids to Measurement – offered in the Spring and is **strongly recommended**
- PHYSICS 551: Solid State Physics – offered in the Fall/Spring and is **strongly recommended**
- ECE 549: Integrated Circuits Fabrication Lab

CORE COURSE WAIVER POLICY

Students who feel they have completed a course at a prior institution or program that covers the curriculum of a core course for the MSPQC program may submit a core course waiver form for program/advisor approval. Core course waivers are evaluated based on previous coursework only; the program will not evaluate a course waiver request based on previous work experience. In order to be eligible for a waiver, the student must be able to demonstrate that the course covers comparable curriculum and they earned a letter grade of B or higher in the course.

Students who wish to waive a core course must do the following:

- Complete a core course waiver form and submit to their faculty advisor and academic advisor
- Provide a syllabus from the course taken that is believed to satisfy the core course requirements
    - In lieu of a syllabus, some faculty advisors may accept the name and author of the textbook used in the course to determine whether the course content aligns with that of the MSPQC core course
- Confirm that they earned a letter grade of B or higher in the course taken

TAKING COURSES OUTSIDE OF PHYSICS

Students in this program cannot enroll concurrently in other undergraduate, graduate or certificate programs.

In addition, the MSPQC program limits the total number of credits taken outside of the Physics Department for elective coursework to 9 total credits (approximately 3 classes). Enrollment in higher than 9 credits taken outside the Physics Department requires faculty advisor approval. The faculty advisor needs to sign the form that can be found in Appendix A.

The form requests the following information:

- The course department, course number, course title, and the number of credits (ex: CS 319, Data Science Programming I for Research, 3 credits)
- A brief course description
- A short justification (written by the student) that indicates the academic or industry/career purpose for taking the course outside of the department

MSPQC TRANSFER CREDITS FOR PRIOR COURSEWORK

PRIOR COURSEWORK: GRADUATE WORK FROM OTHER INSTITUTIONS

The MSPQC Program does not evaluate prior coursework for transfer credit to the program. If a student feels they have completed the curriculum for a required core course in the MSPQC program through a course taken at a prior institution or program, we recommend referring to the core course waiver policy and submitting a core course waiver form. This process waives the course, not the credits toward the MSPQC degree (i.e., students must still take a minimum of 30 credits to complete the MSPQC program).

PRIOR COURSEWORK: UNDERGRADUATE CREDITS EARNED AT UW-MADISON

The MSPQC program will transfer up to seven credits from relevant coursework taken during a UW-Madison undergraduate career. Courses must be numbered 300 or above from the undergraduate career completed at UW–Madison. These credits are not allowed to count toward the 50% graduate coursework minimum unless numbered 700 or above from UW- Madison. The credits are noted on the transcript in the graduate career as transfer credits, but the courses remain in the undergraduate career if taken at UW-Madison.

MSPQC PROGRAM COMPLETION POLICY

Students must have the following in order to graduate:

- Minimum Graduate GPA of 3.0 (on a 4.0 scale) or higher
- Completed a minimum of 30 credits
- The Graduate School requires at least 50% of credits applied toward a graduate degree be earned in courses designed and designated specifically for graduate-level work. (Credits earned as a University Special student do not count toward the 50% graduate coursework minimum and degree requirements unless taken at the 700-level or above). Graduate level coursework is identified with an attribute of "G50%" in the University's Course Guide and Class Search. More information regarding the course attribute can be found here: https://policy.wisc.edu/library/UW-1244.

SATISFACTORY PROGRESS AND ACADEMIC STANDING POLICY

Satisfactory progress is important to stay on track and complete the degree in a timely manner. Graduate students who do not achieve satisfactory progress are considered not in good standing and may not be allowed to continue in the MSPQC program. To achieve satisfactory progress, students must:

- Enroll each semester according to the Graduate School minimum enrollment requirements: https://grad.wisc.edu/documents/enrollment-requirements/
- Enroll in coursework suited to the MSPQC program in consultation with the faculty advisor
- Maintain an overall graduate GPA of 3.0 or above according to the Graduate School GPA requirement: https://grad.wisc.edu/documents/gpa-requirement/

TIMELINE

The MSPQC program is designed so that it can be completed in a single calendar year. However, 4-6 semester/term plans are available. The two most commonly observed timelines are either 3 or 4 semesters for completion of the program. The 4-semester timeline is typical for students that have an internship during the summer or want to apply to a PhD program during the start of their 2nd year in the MSPQC program. All students begin in the Fall semester. Fall semester starts in September, but all students will be required to arrive for new student orientation which will be held during the last week of August. If the student chooses to complete the program in a single calendar year (3 semesters/terms), the MSPQC program finishes at the end of the following summer semester, which is usually in early August. The MSPQC graduate celebration takes place once per academic, occurring at the end of each summer semester. If a student does not complete the program during a summer semester, they may choose to celebrate at the graduation ceremony the summer before or after their degree conferral date.

LEAVE OF ABSENCE

While in most cases participation in the program is continuous over time, students sometimes find it necessary to take a temporary leave of absence. Graduate students may request a leave of absence for one semester by submitting a form outlining the timeline for the leave and general reasons. The faculty advisor must agree that the student is leaving in good standing and may re-enter the program in a reasonable stated length of time. Written requests for a leave of absence should be addressed to the MSPQC Program Director and the Graduate Coordinator. Please note that the Department Chair, in consultation with the Associate Chair and MSPQC Program Director, approves any leave of absence requests.

If a student is granted a one semester leave of absence, the milestone due dates are pushed back one semester. Students may be granted a leave of absence for no more than one semester at a time. Students who do not register for more than one semester (Fall or Spring) will be considered inactive and must apply for re-entry.

Re-entry
Graduate students who leave the program in good standing for more than one term (not including summer) may request re-entry to the program by completing the Graduate School application for re-admission. The MSPQC Admissions Committee, in consultation with the faculty advisor, MSPQC Program Director, Associate Chair, and Department Chair, will review the request the request based on the information provided. The Graduate School outlines the policy for readmission for previously enrolled graduate students: https://grad.wisc.edu/documents/readmission/

Time Limits
In addition, the Graduate School specifies time limits for completion of current coursework. Students who take a leave of absence or re-enter into the program should be aware of these policies: https://grad.wisc.edu/documents/time-limits/

COMMITTEE & DEGREE PROCESSING

The Master's degree committee that evaluates MSPQC graduate student work must coincide with the Graduate School policy on committees: https://grad.wisc.edu/documents/committees/.

Master's committees must have at least one graduate faculty from the Department of Physics, which shall be the faculty advisor. In addition, the MSPQC Program Director will serve on the committee and sign off on the final degree warrant. Students cannot have more than one dissenting vote from their committee on the final degree warrant.

Since the MSPQC program is a coursework only degree, the Graduate Coordinator will automatically request the MS in Physics-Quantum Computing degree warrant from the Graduate School during the final semester of the program. The student does not need to request a warrant for the MSPQC degree.

GRADUATE SCHOOL & CAMPUS POLICIES

DISABILITY ACCOMODATIONS

Students with disabilities are encouraged to inform their faculty advisor and instructor of their need for disability-related accommodations in a timely manner. Implementation of reasonable accommodations is a shared faculty and student responsibility. Faculty, either directly or in coordination with the McBurney Disability Resource Center, are expected to work with students to identify and provide reasonable accommodations.

The McBurney Disability Resource Center provides disability-related services and accommodations to undergraduate, graduate, professional, special and guest students. The Center works closely with students and faculty on the provision of reasonable accommodations to ensure access to the learning environment. The Center makes referrals to other campus offices or community resources for non-classroom accommodations such as housing, transportation, personal care attendants, etc. Students should contact the Center upon admission to begin the eligibility for services process. Early notice is essential in order to have services and accommodations in place prior to the start of the semester.

McBurney Disability Resource Center
702 West Johnson Street, Suite 2104
608/263-2741 (voice)
608/225-7956 (text)
mcburney@studentlife.wisc.edu

GRADE POINT-AVERAGE (GPA) REQUIREMENT

The Graduate School requires each student maintain a cumulative grade-point average (GPA) of 3.00 or greater for all graduate courses (excluding research). Details on GPA policy can be found here: https://policy.wisc.edu/library/UW-1203

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT

The Graduate School's minimum graduate residence credit requirement for graduation can be satisfied only with UW-Madison courses numbered 300 and above taken while enrolled as a graduate student at UW–Madison. Details on graduate residence credit requirement policy can be found here: https://policy.wisc.edu/library/UW-1246

GRADUATE ASSISTANTSHIP POLICY FOR STUDENTS ENROLLED PROFESSIONAL PROGRAMS

Academic programs that use a service-based pricing tuition structure are required to operate in a fully self-supporting manner with tuition revenue being the primary source of funding for operational activities. These programs are intended for non-traditional student populations and offer some combination of accelerated curricula, distance education delivery, and other flexibilities needed by non-traditional students. When these program options were created it was not anticipated that graduate students in these programs would pursue on-campus employment opportunities like graduate assistantships. Part of the compensation for graduate assistantships is remission of tuition charges when the position is at least 33.3% of one FTE. When students enrolled in service-based pricing programs are hired into traditional graduate assistantship positions, the tuition remission associated with the assistantship compromised the operational revenue of the program. Despite proactive communication to limit or prevent these students from accepting these types of positions, there is no mechanism in the hiring process to identify students in these programs and restrict them from being hired into graduate assistantships. As a result, programs have experienced revenue losses due to these tuition remissions. This policy seeks to clarify when and if students enrolled in service-based pricing academic programs are allowed to be hired into graduate assistantships and what the responsibilities students, programs, departments, and central campus administration have in the employment eligibility determination process.

I. Service-based pricing program faculty and staff must disclose remission restrictions for graduation assistantships with the offer of admission, on the program website and Guide pages, in the program handbook, and during program orientation.

II. Students enrolled in a program with a service-based pricing tuition structure may accept graduate assistantships (including those above 33.33%); however, they will not receive the tuition remission that is typically part of the compensation package for a graduate assistantship. The Bursar's Office will enforce this provision in the Student Information System by preventing students in service-based pricing programs from receiving a tuition remission associated with a graduate assistantship.

III. There is no obligation for hiring departments to provide tuition assistance. However, departments that wish to provide tuition assistance can make use of the Internal Third-Party Deferral Process for financial incentives. The Internal Third-Party Deferral Process credits a student's tuition account with funds paid by a UW–Madison department.

SATISFACTORY/UNSATISFACTORY (S/U) GRADES

For all courses listed as research, the only permissible grades are Satisfactory (S), Unsatisfactory (U), and Progress (P). Details on satisfactory/unsatisfactory grades policy can be found here: https://policy.wisc.edu/library/UW-1231).

PASS/FAIL COURSES

Pass/fail courses do not satisfy any Graduate School credit, coursework, or degree requirements, nor do they fulfill minimum or maximum credits required each term. Tuition is still charged for pass/fail courses. For these reasons, very few graduate students choose pass/fail for courses numbered 300 or above. Seminars, independent study, and research may not be taken pass/fail. The pass/fail option is not to be confused with the S/U (Satisfactory/Unsatisfactory) grading option. Details on pass/fail courses policy can be found here: https://policy.wisc.edu/library/UW-1215.

PROGRAM ENROLLMENT FOR PROFESSIONAL MASTER'S PROGRAMS

Students in the MSPQC program (and other professional degree programs at UW) cannot enroll in any other degree program at UW-Madison simultaneously. Students may take courses outside of the Department of Physics as it relates to the progress towards the MSPQC degree.
Details on enrollment policy requirements can be found here: https://policy.wisc.edu/library/UW-1208

POLICIES SPECIFIC TO F-1/J-1 VISA HOLDERS

FULL-TIME ENROLLMENT

F-1 and J-1 student visa holders are required to enroll full-time on the campus which issued their I-20 (F-1) or DS-2019 (J-1). There are restrictions on how many online credits can count toward minimum full-time enrollment requirements. Students studying only online are not able to enter or remain in the U.S. as an F-1 or J-1 student. More details regarding full-time enrollment for F-1 and J-1 Visa holders can be found here: https://iss.wisc.edu/full-time-enrollment/.

REDUCED COURSE LOAD

All F-1 and J-1 students must enroll in a full-time course load each fall and spring semester. Summer enrollment is generally not required unless it is your initial semester on your I-20/DS-2019. The Student and Exchange Visitor Program (SEVP) permits a limited number of reasons for requesting a reduced course load per semester. More details regarding reduced coarse load can be found here: https://iss.wisc.edu/students/current-students/reduced-course-load/.

EXTENSION OF STAY

Your program end date on page 1 of your I-20/DS-2019 is an estimated date by which you will complete your major and degree level. If you need extra time to complete your program of study, you must request an extension of your I-20 or DS-2019 at least 1 month before the document expires. More details regarding extending your stay can be found here: https://iss.wisc.edu/students/current-students/extend-your-study/.

EMPLOYMENT AND F-1 VISA

Useful resources on employment and curricular practical training can be found in these links:

- https://iss.wisc.edu/students/current-students/extend-your-study/
- https://iss.wisc.edu/employment/f1-employment/f-1-curricular-practical-training-cpt/

TUITION & FEES

Tuition for the MSPQC program is $1,600 per credit. In addition, all enrolled graduate students must pay UW-Madison segregated fees assessed each semester. Students can find their officially assessed tuition rate by accessing MyUW Student Center and viewing the "Tuition Account Summary" located under "Finances": https://bursar.wisc.edu/tuition-and-fees

DUE DATES

Tuition Dates & Deadlines (Bursar's Office)
https://bursar.wisc.edu/student-tuition-account

Enrollment Dates & Deadlines (Office of the Registrar)
https://registrar.wisc.edu/dates/

UW-Madison Academic Calendar
https://secfac.wisc.edu/academic-calendar/

FUNDING RESOURCES

- https://grad.wisc.edu/funding/
- https://financialaid.wisc.edu/
- https://studentjobs.wisc.edu/

GRIEVANCES

Graduate students should consult their faculty advisor, MSPQC Program Director, MSPQC Program Associate Director or Graduate Coordinator about any concerns related to academic issues or the academic environment. Graduate students may also reach out directly to the Department Chair as an alternate approach. The hope is that this will result in the development of a working environment that all will find supportive. If graduate students have a question of whether or not a situation or discomfort should be discussed, the answer is YES! Any issue that is troubling should be addressed and, if it is within the Department's authority, it will be resolved.

If a graduate student feels unfairly treated or aggrieved by faculty, staff, or another student, it is recommended that the concerns are first handled directly with the person responsible for the objectionable action, if possible. If the student is uncomfortable making direct contact with the individual(s) involved, the student should contact the faculty advisor or the person in charge of the unit where the action occurred (program or department chair, section chair, lab manager, etc.), and/or contact the people mentioned above.

There are also resources and formal grievance procedures at the campus level that can be followed, which are outlined in the Graduate School policies: https://grad.wisc.edu/documents/grievances-and-appeals/

ADDITIONAL RESOURCES

Department resources: https://www.physics.wisc.edu/uw-student-resources/
GPA calculator: https://advising.wisc.edu/gpa-calculator/

EXCEPTIONS

The MSPQC Program Director and the Chair of the Department have the authority to make individual exceptions to policies found in the MSPQC program handbook. Exceptions must involve extenuating and/or unique individual circumstances. Requests for such exceptions should be made in writing to the MSPQC Program Director, and/or the Department Chair.

Appendix A: MSPQC Elective Substitution Approval Form (Outside PHYS)

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Elective Course Request Form: For Courses Outside PHYSICS

SECTION 1: For Student to Complete	
Student's Name	
ID Number	
Email Address	
Advisor's Name	
New Course Department	
New Course Number	
New Course Title	
New Course Description from Catalog or Syllabus	
New Course Credits	
Why Is this Course Relevant to your Academic and/or Career Plans?	
When Will the Course Be Taken	
SECTION 2: For Faculty Advisor to Complete	
Have You Discussed this Change with Your Advisee?	
Does this Course Request Remain in Line with the Original Goals/Learning Objectives of the MSPQC Program?	
Advisor Signature:	

Appendix B: MSPQC Research Approval Form

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Research or Independent Study Approval Form

Student Name_____ Campus ID _____ Semester Requested _____
Instructor of Record (must be Physics Faculty) _____
Active Supervisor/Advisor (if different from above) _____Department ___

Brief description of course content and proposed work:

Description of proposed written summary report. This report need not be lengthy, but should be indicative of what was actually accomplished. Please briefly summarize what outcome/summary report/deliverable is expected by the faculty advisor at the completion of your research/independent study opportunity.

This research experience is (check 1):

- ☐ Paid, student hourly
- ☐ Paid, research assistant stipend
- ☐ Unpaid

Note: If paid hourly, indicate the hourly rate here _____

Indicate number of credits associated with this semester-long experience (paid and unpaid experiences qualify):

Planned average hours/week of work _____ for _____weeks.
Proposed number of credits (1,2, or 3) _____

Note: minimum of 45 hours work is expected for each credit.
Note: if the student is not earning credit, list number of credits as ***0***

Number of meetings planned with supervisor _____.

Signed _____ date_____
(Student)

_____ date _____
(Instructor of record)