

QUANTUM COMPUTING, MS

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum degree requirements (<https://guide.wisc.edu/graduate/#requirements>) and policies (<https://guide.wisc.edu/graduate/#policies>), in addition to the program requirements listed below.

MAJOR 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

| Requirements | 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's 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 | None. |
| Language Requirements | None. |

REQUIRED COURSES

| Code | Title | Credits |
|--|-----------------------------------|-----------|
| Core | | |
| PHYSICS 701 | Graduate Introductory Seminars | 1 |
| PHYSICS 707 | Quantum Computing Laboratory | 4 |
| PHYSICS 709 | Introduction to Quantum Computing | 3 |
| PHYSICS 763 | Qubit Tune-Up and Programming | 3 |
| PHYSICS 779 | Advanced Quantum Computing | 3 |
| Core Electives | | |
| Students must complete at least 2 courses from the following: | | 6 |
| PHYSICS 448 | Atomic and Quantum Physics | |
| PHYSICS 449 | Atomic and Quantum Physics | |
| PHYSICS 531 | Introduction to Quantum Mechanics | |
| PHYSICS 545 | Introduction to Atomic Structure | |
| PHYSICS 551 | Solid State Physics | |
| PHYSICS 731 | Quantum Mechanics | |
| PHYSICS 732 | Quantum Mechanics | |
| Pathway¹ | | |
| Students must complete their selected pathway courses to satisfy the minimum credit requirement. Refer to the appropriate pathway table below for specific requirements. | | 10 |
| Total Credits | | 30 |

Software Pathway¹

| Code | Title | Credits |
|--|--|-----------|
| Quantum Algorithms | | |
| Students in the Software Pathway must complete the following course: | | |
| PHYSICS 765 | Quantum Algorithms and Error Correction | 3 |
| Electives | | |
| Students complete courses from the following: | | 7 |
| COMP SCI 319 | Data Science Programming I for Research | |
| COMP SCI 412 | Introduction to Numerical Methods | |
| COMP SCI/ E C E 506 | Software Engineering | |
| COMP SCI/ E C E/ E M A/E P/ M E 759 | High Performance Computing for Applications in Engineering | |
| PHYSICS 799 | Independent Study | |
| Total Credits | | 10 |

Hardware Pathway¹

Students must choose to complete the Atomic Molecular Optical (AMO) Option or the Solid State Option.

Atomic Molecular (AMO) Option

| Code | Title | Credits |
|---|--|----------------|
| Fundamentals and Application | | |
| Students in the AMO Option must complete the following courses: | | |
| PHYSICS 623 | Electronic Aids to Measurement | 4 |
| PHYSICS 625 | Applied Optics | 4 |
| Elective | | |
| Students complete courses from the following: | | 2-3 |
| E C E 835 | Light Interactions with Quantum Materials (Elective) | |
| PHYSICS 799 | Independent Study | |
| Total Credits | | 10 |

Solid State Option

| Code | Title | Credits |
|---|---|----------------|
| Fundamentals and Properties | | |
| Students in the Solid State Option must complete the following courses: | | |
| PHYSICS 623 | Electronic Aids to Measurement | 4 |
| PHYSICS 551 | Solid State Physics | 3 |
| Elective | | |
| Students complete courses from the following: | | 3-4 |
| E C E 549 | Integrated Circuit Fabrication Laboratory | |
| PHYSICS 799 | Independent Study | |
| Total Credits | | 10 |

¹ These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

OTHER POLICY

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.