Program Change Request

New Program Proposal

Date Submitted: 08/19/25 12:47 pm

Viewing: : Quantum Science and Engineering, MS

Last edit: 08/19/25 12:52 pm

Changes proposed by: jbazaz

Are you completing this form on someone else's behalf?	No
Effective Catalog:	2026-2027
Program Level:	Graduate
Program Type:	Master's
Degree Type:	Master of Science
Title:	Quantum Science and Engineering, MS
Banner Title:	Quantum Science & Eng, MS
Is this a retitling of an existing program?	No
Registrar/OAPI Use Only – SCHEV Status	Pending Approval
Registrar's Office Use Only – Program Start Term	
Registrar/OAPI Use Only – SCHEV	

In Workflow

1. **SC Curriculum Committee**
2. SC Program Chair
3. SC Curriculum Committee
4. SC Assistant Dean
5. EC Associate Dean-Graduate
6. Assoc Provost-Graduate
7. SACSCOC New Program Approval
8. SCHEV New Program Approval
9. Registrar:Create Code
10. Registrar-Programs: Duration
11. Registrar-Programs

Letter

Registrar/OAPI Use Only – SACSCOC Status

Concentration(s):

Registrar/IRR Use Only – Concentration CIP Code

College/School: College of Science

Department / Academic Unit: College of Science

Jointly Owned Program? Yes

Participating Colleges

	College
1	College of Engineering and Computing

Participating Departments

Justification

What: COS and CEC are creating a new master's program.

Why: Quantum science is one of the most fundamental disciplines for understanding our universe. Quantum engineering applies this knowledge to create groundbreaking technologies that address some of society's most pressing challenges. Together, they have the power to drive innovation, strengthen competitiveness, and foster collaboration—but realizing this potential requires significant investment in education and workforce development.

Advances in quantum science and engineering carry profound implications for national security and U.S. leadership in technology. For instance, Shor's factoring algorithm threatens classical encryption systems, while quantum simulations can achieve levels of performance far beyond

classical computing. Yet Virginia currently lacks a robust pipeline of professionals trained to design, develop, and responsibly deploy quantum technologies.

The proposed Master's in Quantum Science and Engineering will meet this need, preparing a skilled workforce and unlocking the transformative potential of quantum technologies for the Commonwealth, the nation, and the world.

*CIP code below needs correction to 40.0810

Total Credits Required: Total credits: 30

Registrar's Office Use Only - Program Code:

Registrar/IRR Use Only – Program CIP Code 40.0801 - Physics, General.

Admission Requirements:

Admissions

University-wide admissions policies can be found in the Graduate Admissions Policies section of this catalog. International students and students having earned international degrees should also refer to Admission of International Students section of this catalog.
Applications will be reviewed by the admissions committee. At the discretion of the program director, students without the requisite coursework in mathematics or computer programming may be required to take QSE 501 Mathematical Foundations of QSE or QSE 502 Programming Foundations of QSE (respectively) in place of other elective courses. Only one of either QSE 501 Mathematical Foundations of QSE or QSE 502 Programming Foundations of QSE (a total of 3-credit-hours) may be counted toward a 30-credit-hour degree. If the program director deems both QSE 501 Mathematical Foundations of QSE and QSE 502 Programming Foundations of QSE necessary, both should be taken, but only a total of 3 credit hours will count toward the 30-credit-hour coursework total.

Eligibility

Individuals holding a baccalaureate degree with a strong background in science, technology, engineering, or mathematics (STEM) from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent and who have earned an overall GPA of 3.00 (out of 4.00) are invited to apply for admission.

Based on the program director's assessment, eligible applicants may be provisionally admitted into the program and required to make up one or two course deficiencies (the *Foundational Electives* curriculum section).

Application Requirements

To apply for this program, prospective students should submit the George Mason University Admissions Application and its required supplemental documentation, and two letters of recommendation from individuals with knowledge of the applicant's preparation for and likelihood of success in studies for an MS in quantum science and engineering.

The GRE general is not required.

Program-Specific Policies:

Policies

For policies governing all graduate programs, see AP.6 Graduate Policies.

Transferring Previous Graduate Credit into this Program

Previously earned and relevant graduate credits may be eligible for transfer into this program; details can be found in the Credit by Exam or Transfer section of this catalog.

Students should refer to the Admissions & Policies tab for specific policies related to this program.

Plan of Study

Before the beginning of their first semester, students are advised to meet with their academic advisor and develop a preliminary plan of study. A final plan of study must be approved by the program director at the start of the semester in which the student graduates.

Degree Requirements:

This program prepares students for the interdisciplinary quantum science and engineering workforce through the study of physics, mathematics, computer science, and engineering. Students must complete a minimum of 30 graduate credits beyond the bachelor's degree. The plan of study for the

degree must fulfill the requirements specified below.

Core Courses

QSE 500	Ideas in Quantum Science and Technology	3
QSE 511	Quantum Algorithms	3
QSE 520	Applications of Quantum Technology	3
QSE 570	Quantum Computing System Design	3
or ECE 570	Quantum Computing System Design	
QSE 798	Master's Research Project	3
Total Credits		15

Foundational Electives

Depending upon their background when joining the program, students select one or both of the following courses, only one of which can replace a Specialized Elective. If a second Foundational Elective is needed, it must be taken beyond the degree's total 30 credits.		0-3
QSE 501	Mathematical Foundations of QSE	
or QSE 502	Programming Foundations of QSE	
Total Credits		0-3

Advanced Quantum Restricted Electives

Select at least two courses from the following:		6-12
QSE 505	Classical and Quantum Information Theory	
QSE 611	Advanced Quantum Algorithms	

QSE 621	Quantum Error Correction	
QSE 799	Master's Thesis	
Total Credits		6-12

Specialized Electives

Select remaining courses from the following list:		0-9
ASTR 601	Computer Simulation in Astronomy	
BINF 690	Numerical Methods for Bioinformatics	
CS 583	Analysis of Algorithms	
CS 630	Advanced Algorithms	
CS 635	Foundations of Parallel Computation	
CSI 690	Numerical Methods	
CSI 782	Statistical Mechanics for Modeling and Simulation	
CSI 786	Molecular Dynamics Modeling	
ECE 511	Computer Architecture	
ECE 547	Applied Cryptography	
ECE 633	Error Control Coding	
ECE 647	Post-Quantum Cryptography	
GGS 579	Remote Sensing	
GGS 754	Earth Science Data and Advanced Data Analysis	
MATH 625	Numerical Linear Algebra	
MATH 685	Numerical Analysis	

MATH 686	Numerical Solutions of Differential Equations
PHYS 510	Computational Physics I
PHYS 613	Computational Physics II
PHYS 736	Computational Quantum Mechanics
With written approval from the program director, students may select 3 credits of additional and relevant coursework.	
Total Credits	0-9

Retroactive Requirements Updates:

Plan of Study:

Program Outcomes

Additional Program Information

This information is required by the Office of Accreditation and Program Integrity.

Courses offered via distance (if applicable):

What is the primary delivery format for the program?

Face-to-Face Only

Does any portion of this program occur off-campus?

No

Are you working with a vendor / other collaborators to offer your program?

No

Related Departments

Department
College of Engineering and Computing

Could this program prepare students for any type of professional licensure, in Virginia or elsewhere?

No

Are you adding or removing a licensure component?

No

Additional SCHEV & SACSCOC Information

Is the content of the new program closely related to that of an existing approved program at the same instructional level (i.e., baccalaureate, master's doctoral)?

No

Is this new program considered to be "advancing the degree level of a currently approved program" (i.e. existing content is at lower degree level, new content is at the higher degree level)?

No

Is this new program considered to be "lowering the degree level of a currently approved program" (i.e. existing content is at higher degree level, new content is at the lower degree level)?

No

Is this a re-opening of a program that was closed to admission within the last five years?

No

What are the methods of delivery for the program?

Face-to-Face Only

Does this program include a course/credit-based competency-based education delivery option?

No

Percentage of total credits containing new course content. ("New course content" is defined by SACSCOC as content that is not currently included in a existing approved degree/certificate program at the same instructional level. Do not exclude gen ed credits in calculations for undergraduate programs.)

50%-100%

Will any additional equipment/facilities be needed?

No

Will any additional faculty be required?

No

Will any additional financial resources be needed?

No

Additional library/learning resources needed?

No

Have you reached out to the Libraries to determine whether there are adequate resources to support your program? If not, please email Meg Meiman, Associate University Librarian for Learning, Research, and Engagement at mmeiman2@gmu.edu.

Yes

OAPI Use Only – Determination of SACSCOC Impact

Comments or Notes

Does this program cover material which crosses into another department?

No

Additional Attachments

SCHEV Proposal QuantumMSSCHEVdraft.pdf

Executive Summary

The purpose of the proposed MS degree program in Quantum Science and Engineering is to prepare students with knowledge and skills in quantum technologies. Students will be educated in basic quantum theory, quantum algorithms, and applications of quantum technologies. Students will learn the

necessary mathematics, algorithm analysis, and computer programming, as well as gaining software engineering skills. Through an experiential learning option, students will gain experience working in professional research and development settings. Graduates will be able to find work in the quantum industry in either research and development roles, management roles, or will be prepared to pursue more specialized study at the doctoral level. Graduates will have the skills and knowledge to communicate across disciplinary boundaries to a variety of audiences. Graduates of the proposed degree program will be able to evaluate the utility of quantum solutions in a range of settings.

Reviewer Comments

Additional Comments

Is this course required of all students in this degree program?

%wi_required.eschtml%

Key: 1127