

CM Program Code Quantum Science and Technology

Under Review | Fall 2024

Proposal Information

Workflow Status

In Progress

Faculty Senate Approval, Faculty Senate

expand ▲

Waiting for Approval | Faculty Senate Approval

Rick Holmes

Nancy Middlebrook

Proposal Information

Sponsoring faculty/staff member

Victor Acosta

Sponsoring faculty/staff email

vmacosta@unm.edu

College

Interdepartmental Shared
Credit and Dual Degrees

Department

Interdepartmental Shared
Credit and Dual Degrees

Campus

Main Campus

Effective Term and Year

Proposed Effective Term and Year

Fall 2024

Justification

Program Justification

The University of New Mexico was recently awarded a \$3M grant from NSF, "NRT-QL: Quantum Photonics interdisciplinary training to Advance Quantum Technologies (QPAQT)". The goal of the award is to introduce and sustain a graduate program in quantum technology at the intersection of physics, chemistry, and engineering. In order to carry out this ambitious goal, the QPAQT program faculty and leadership propose a new Graduate Certificate (GCERT) in Quantum Science & Technology.

The GCERT in Quantum Science & Technology fulfills two areas of need:

1) A transcribed certificate that is awarded to students who complete the QPAQT program. This award has \$2.3M allocated over the next 6 years to cover grad student stipends, tuition, fringe, and program perks for 45 "funded" graduate students. There is also funding for at least 45 "unfunded" students who will still receive funds for conference travel, laptops, software, textbooks, and related items. The transcribed certificate will be an incentive for trainees to complete all program elements and acknowledge their education gained through the program.

2) This will be UNM's first transcribed certificate in quantum science and technology available to students in Physics, Chemistry, Optical Science and Engineering (OSE), and Engineering programs. The Physics PhD and Computer Engineering MS programs have concentrations in Quantum Information Science/Systems that traditionally had a quantum information theory focus. Students in Engineering and Chemistry PhD programs do not have access to a transcribed concentration or certificate that asserts education and expertise in quantum science and technology. The GCERT will draw in students without a heavy math/physics/quantum background with a broadly inclusive curriculum in quantum science and technology. The GCERT has been designed to allow Physics PhD/Computer Engineering MS students to obtain both the GCERT and Quantum Information concentration with minimal additional requirements.

Program Category and Level

Program Category

Certificate

Program Level

Graduate

Degree, Minor, or Certificate Name

Quantum Science and Technology

Degree Type

Certificate (graduate)

Degree/Certificate Level

Graduate Certificate

CIP Code ⓘ

30.9999

CIP Title ⓘ

Multi-/Interdisciplinary Studies, Other

Is this program also offered online?

No

New program courses

Composition of new program

Existing courses	Revised courses	New Courses	Total Credits
13			13

Pre-proposal (new degrees/certificates only)

Pre-proposal Executive Summary

- Pre-proposal GCERT Quantum Science and Technology.pdf
- GCERT GCERT in Quantum Science & Technology.pdf

Program Duplication

Faculty and Chairs from ECE, CCB, and P&A have been consulted in drafting the Certificate Program, and the proposal was approved by each Dept Chair (see Memos).

This will be UNM's first transcribed certificate in quantum science and technology available to students in Physics, Chemistry, Optical Science and Engineering (OSE), and Engineering programs. Interface with existing concentrations in related areas is discussed in the preproposal.

Correspondence

- Memo on GCERT from PA.pdf
- Acosta_GCERT_CCB.pdf
- memo_on_GCERT_ece.pdf

Pre-proposal Approved?

Approved

File uploads

Proposal File Upload

- GCERT_newhed_QuantumScienceandTechnology.pdf

Associated Forms

Select any associated course forms that exist

Select any associated program forms that exist

Catalog Information

Program Description

Quantum science and technology harnesses the unique features of quantum mechanical systems, such as quantum superposition and entanglement, for devices that hold the promise to revolutionize future technologies in computing, communication, and sensing, and deepen our understanding of the universe. Potential outcomes include an exponential speedup in computation in specific algorithms, construction of a quantum Internet that sends information securely and anonymously, and the widespread use of sensors with a precision that is orders of magnitude better than traditional devices limited by classical noise.

The Quantum Science & Technology Graduate Certificate program will train students to be generalists in quantum technology and give them the tools and academic preparation for a wide variety of quantum science and technology applications. The program is designed to run concurrently with MS/PhD programs including Chemistry, Physics, Optical Sciences & Engineering, and Engineering. Following satisfactory completion of the program requirements, the transcribed certificate will assert education and expertise in quantum science and technology.

Admissions Requirements

Students must be enrolled in a MS or PhD program in Chemistry, Physics, Optical Sciences & Engineering, Engineering, or a related program with advisor approval.

Graduation Requirements

Students must maintain an average GPA of 3.0 or better in program courses. Students must pass the Capstone Presentation as part of their 650 Research credits.

Professional Credential/Licensure Program Information

License/Certification associated with program

No

Concentrations

Program Concentrations

Code

Title

Concentration Required

No

Certificate Information

Certificate Requirements

- Complete all of the following
 - Complete at least 1 of the following:
 - CHEM573 - Introduction to Quantum Technology for Chemists and Engineers (3)
 - PHYS566 - Quantum Optics (3)
 - ECE 573 can replace CHEM 573.
 - Complete the following:
 - PHYS575 - Principles and Platforms of Quantum Technology (3)
 - CHEM 575 or ECE 587 can replace PHYS 575.
 - Complete at least 1 of the following:
 - CHEM567 - Topics in Physical Chemistry (3)
 - CHEM505 - Molecular Simulation (3)
 - CHEM501 - Molecular Structure Theory (3)
 - CHEM504 - Chemical Dynamics (3)
 - PHYS545 - Introduction to Quantum Information Science (3)
 - ECE545 - Introduction to Quantum Information Science (3)
 - PHYS571 - Quantum Computation (3)
 - PHYS572 - Quantum Information Theory (3)
 - PHYS476L - Experimental Techniques of Optics (3)
 - PHYS477L - Experimental Techniques of Optics (3)
 - PHYS463 - Advanced Optics I (3)
 - ECE463 - Advanced Optics I (3)
 - ECE564 - Guided Wave Optics (3)
 - ECE547 - Quantum Error Correction (3)
 - PHYS554 - Advanced Optics II (3)
 - ECE554 - Advanced Optics II (3)
 - The 3-credit elective above can also be satisfied by another 3-credit elective with advisor approval
 - Earn at least 3 credits from the following types of courses:
 - Any 650 Research course with approval from advisor.
 - Earn at least 1 credits from the following types of courses:
 - Any 500 Seminar course with approval from advisor.

Grand Total Credits: 13