QUANTUM ENGINEERING -MINOR

The minor in quantum engineering provides training and a solid foundation in quantum technologies. Quantum technologies have applications in quantum-enhanced sensors, quantum communications and quantum computing. The goal is to introduce students to the fundamentals of quantum theory and explore all of the major hardware platforms. This will allow graduates to easily adapt to the variety of technologies seen in industry. The skills obtained in this minor are important to students who expect to participate in real-world situations that increasingly involve quantum technologies.

Requirements

The quantum engineering minor requires a minimum of 18 credit hours.

A minor in quantum engineering can be earned in conjunction with any CU Boulder major. The quantum engineering minor can be completed alongside no more than one of the following minors: computer engineering, electrical engineering and signals & systems engineering.

Prerequisites

- Programming: ECEN 1310, CSCI 1200, CSCI 1300, APPM 3050, PHYS 2600, ASTR 2600, MCEN 1030 or similar (C- or higher)
- · Calculus 2 (minimum): APPM 1360 or MATH 2300 (C- or higher)
- Linear Algebra: APPM 2360, MATH 2130, MATH 2135, MATH 3135, APPM 3310 or CSCI 2820 (C- or higher)

Additionally, it is recommended that students have taken Calculus 3 (APPM 2350 or MATH 2400), Probability (APPM 3570, STAT 3100, MATH 3510, ECEN 3810 or similar) and PHYS 2130 as preparatory subjects for the minor.

Students who have completed all above courses are encouraged to apply for the minor. Additionally, students who have completed all but one of the above courses, with the last required course currently in-progress, are also eligible to apply for the minor.

Grade Requirements

A minimum cumulative GPA of 2.000 is required in the courses used to satisfy the minor requirements. Each individual course that is counted toward this minor must be passed with a grade of D- or higher (note that a minimum grade of C- is required in all prerequisite courses).

Residency Requirements

At least 9 credit hours for the minor must be taken on the CU Boulder campus.

Required Courses and Credits

The Quantum Engineering minor consists of a set of required core courses and a selection of electives, as follows.

Code	Title	Credit Hours	
Foundations Courses			
ECEN 3915 or PHYS 3220 & PHYS 4410	Foundations of Quantum Engineering Quantum Mechanics 1 and Quantum Mechanics 2	3-6	
ECEN 4925	Foundations of Quantum Hardware	3	

Total Credit Hours		9 18-21
Choose 9 credit hours of approved upper-division technical coursework. ¹		
Electives		
3090		
CSCI/PHYS/ECEN	Introduction to Quantum Computing	3

Refer to the course options listed on the ECEE Quantum Engineering Minor (https://www.colorado.edu/ecee/academics/undergraduateprograms/minor-programs/#quantum_engineering-545)webpage.