QUANTUM INFORMATION SCIENCE MINOR

Overview

for the Undergraduate Minor in Quantum Information Science

The undergraduate minor in Quantum Information Science (QIS) offers students an interdisciplinary introduction to quantum information processing in terms of fundamental principles and hardware designs. The subjects of quantum computing and communication are taught within a broad curriculum that spans quantum mechanics, quantum algorithms, quantum information theory, quantum photonics and materials, and quantum devices. The minor requires students to take at least 16 hours of quantum information courses offered across Electrical and Computer Engineering, Physics, Computer Science, Mathematics, and Materials Science and Engineering. These courses focus on material that is strongly connected to cutting-edge research areas and current interests within the QIS industry. Completing this minor will provide students with a strong foundation for advancing their careers in Quantum Information Science (QIS), whether they choose to pursue a graduate degree or join the rapidly growing QIS workforce after graduation.

Degree Requirements

for the Undergraduate Minor in Quantum Information Science

Code	Title	Hours
Core Courses - At least two courses must be selected from the list below.		
CS 478	Quantum Algorithms and Complexity	
ECE 305	Quantum Systems I	
ECE 404	Quantum Information Theory	
ECE 405	Quantum Systems II	
ECE 406	Quantum Optics and Devices	
PHYS 370	Introduction to Quantum Information and Computing	
Elective Courses - Additional courses can be selected from the list below or in consultation with an advisor.		
CS 374	Introduction to Algorithms & Models of Computation	
MATH 416	Abstract Linear Algebra	
MSE 404	Laboratory Studies in Materials Science and Engineering (Sections QS & QM)	
PHYS 403	Modern Experimental Physics	
PHYS 446	Modern Computational Physics	
PHYS 485	Atomic Phys & Quantum Theory	
PHYS 486	Quantum Physics I	
PHYS 487	Quantum Physics II	
PHYS 495	Where the Arts Meets Physics	
Total Hours		**16**

Learning Outcomes

for the Undergraduate Minor in Quantum Information Science

Quantum Information Science (QIS) is an interdisciplinary field cutting across many areas of science and technology. This minor aims to support a wide range of undergraduate students by providing them with a common QIS foundation and fostering their interests in diverse quantum areas such as computing, algorithms, communication, and devices. The curriculum is designed to help meet the growing demands and expectations from the QIS research and industry sectors.

Students earning a minor in Quantum Information Science will be able to:

- Identify and explain how the use of quantum bits, called “qubits”, can enable new computing and information applications such enhanced computation, secure communication, and faster simulation;
- Solve theoretical and experimental problems in QIS based on a rigorous foundation and broad competency obtained in quantum mechanics, information theory, and quantum hardware;
- Communicate effectively with students and researchers across different areas of QIS through the development a common “language” that reflects the standards and conceptual foundation shared among theoreticians and experimentalists in the field;
- Prepare competitive application material for QIS research programs or industry positions using their broad understanding of the QIS landscape and their technical depth acquired on specific topics of interest.

Contact Information

for the Undergraduate Minor in Quantum Information Science

The Grainger College of Engineering (https://grainger.illinois.edu/)

Quantum Information Science Minor in Engineering (https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/)
For more information regarding the Undergraduate minor in Quantum Information Science, contact Grainger Academic Advising Center (https://advising.grainger.illinois.edu/advising/college/).