

The Minor in Quantum Engineering

Quantum engineering is an emerging field that fuses physics, engineering, and computer science. It incorporates radical new ideas for computing, materials, devices and sensors. Advances in quantum sensing, encryption, and computing will transform science and engineering and have a far-reaching impact on the industry, the economy, and other aspects of our society.

The Minor in Quantum Engineering integrates quantum knowledge — quantum physics, quantum information science, and quantum technologies — into the engineering education at Washington University. The curriculum encompasses both fundamental physics and the broad engineering skill set necessary to meet the practical challenges of the future.

Students with background in applied physics or electrical engineering are ideal candidates for this program, but the minor is open to any undergraduate student enrolled in a degree program at Washington University in St. Louis.

Prerequisites

The course ESE 4301 Quantum Mechanics for Engineers is designed to be the entry course for the quantum engineering curriculum, which provides the foundations — that is, the mathematical and physical knowledge — required for all subsequent core courses. By design, this course is made to be accessible to second-year engineering undergraduates with knowledge of linear algebra and calculus at the level of ESE 318/ESE 319 Engineering Mathematics A/B or the equivalent.

Required Courses

The Minor in Quantum Engineering requires the completion of 15 units from the courses listed below. At least two courses must be from the Core Courses list.

Core Courses

Students select at least two courses from this list:

Code	Title	Units
ESE 429	Basic Principles of Quantum Optics and Quantum Information	3
or ESE 536	Introduction to Quantum Optics	
ESE 4301	Quantum Mechanics for Engineers	3
ESE 431	Introduction to Quantum Electronics	3
CSE 468T	Introduction to Quantum Computing	3

Program Electives

Code	Title	Units
Physics 318	Introduction to Quantum Physics II	3
or Physics 471	Quantum Mechanics	
or Physics 523	Quantum Mechanics I	
ESE 436	Semiconductor Devices	3
ESE 439	Introduction to Quantum Communications	3
ESE 532	Introduction to Nano-Photonic Devices	3
ESE 582	Fundamentals and Applications of Modern Optical Imaging	3
Chem 401	Physical Chemistry I	3
Chem 533	Time-Dependent Quantum Mechanics & Spectroscopy	3
Chem 543	Physical Properties of Quantum Nanostructures	3
Math 444	The Mathematics of Quantum Theory	3
Math 528	Topics in Functional Analysis II	3
Physics 472	Solid State Physics	3
Physics 589	Selected Topics in Physics I	3

For more information, contact the director for the minor, Jung-Tsung Shen.