

Introduction to Quantum Engineering (PHY 314)

Credit Hours: 3

Instructor: Ata Ul haq, Adam Zaman Chaudhry

Schedule: Monday to Friday (2.45 PM – 4.45 PM)

The dawn of the electronic revolution was heralded by the invention of the transistor, the understanding of which was based on quantum mechanics. As we continue on the road towards ever increasing miniaturization and approach the breaking of Moore's law by packing more and more transistors in integrated circuits, it is clear that quantum effects will play an even more important role in devices of the future. These unimaginably powerful devices are expected to use the most bizarre quantum effects such as quantum superposition and entanglement.

In this course, we discuss the theoretical foundation and practical implementation of these emerging quantum technologies. Physical systems that will be discussed include photonic structures and photonic networks, nitrogen vacancy centers and superconducting qubits. It will also be demonstrated, for example, how to use these systems in the measurement of physical quantities with extreme precision. Implementation of basic quantum computing architectures will be discussed in detail.