

The Hong Kong University of Science and Technology

UG Course Syllabus

Quantum Mechanics for Electronic Engineers

ELEC 4010P

Credits: 3

Pre-requisites: [MATH 2350 OR (MATH 2111 AND MATH 2351)] AND ELEC 2600 AND PHYS 1114

Exclusion: PHYS 3036, PHYS 3037

Name: Andrew Wing On Poon

Email: eeawpoon@ust.hk

Course Description

An introductory course on quantum mechanics for electronic engineers. This course will introduce the basic principles of quantum mechanics for electronic engineers with emphasis towards applications in semiconductor device physics and quantum information processing using electrons and photons. This course will provide the fundamental background in quantum mechanics for other senior electives in microelectronics and optoelectronics. The course delivery will be lecture-based with tutorials. Students will conduct an independent study project on quantum mechanical technologies. Topics include waves and quantum mechanics, Schrödinger's equation, quantum states, quantum confinement and tunneling, the harmonic oscillator, the time-dependent Schrödinger equation, linear superposition and time dependence, quantum mechanical measurement and expectation values, the Hamiltonian, state vectors, operators, commutation relations, angular momentum, spin, quantum information and computation.

Intended Learning Outcomes:

- An ability to apply fundamental knowledge of quantum mechanics to electronic engineering.
- An ability to communicate effectively using concepts in quantum mechanics.
- An ability to understand the technological impact of quantum mechanics.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)
Homework	35%
Quizzes (3 quizzes on CANVAS to be conducted during tutorials)	15%
Course Project (presentation/term paper)	5%/10%
Final examination	35%

Required Texts and Materials

Text: Quantum Mechanics for Scientists and Engineers, David A. B. Miller, Cambridge

Reference: Quantum mechanics: theory and experiment, Mark Beck, Oxford

Additional Resources

Additional journal or magazine articles will be available on the course CANVAS page.