



# SH2381 Quantum Information

## 7.5 credits

### Kvantinformation

This is a translation of the Swedish, legally binding, course syllabus.

### Establishment

The headmaster at the SCI school has 2021-10-13 decided to establish this syllabus to apply from Spring 2022, registration number: S-2021-1295.

### Grading scale

A, B, C, D, E, FX, F

### Education cycle

Second cycle

### Main field of study

Engineering Physics

### Specific prerequisites

Completed course in quantum mechanics, corresponding to the content of course SI2380.

English B / English 6

### Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

After completion of the course, you should be able to:

- describe the principles of qubits, different types of quantum gates and quantum circuits
- analyze the properties of simpler quantum algorithms
- perform calculations of simpler quantum information processes
- describe the principles of quantum teleportation and quantum cryptography
- explain the mechanisms behind bit errors and quantum error correction
- perform and report on laboratory work related to quantum information

## Course contents

Physical and information theoretic principles of quantum information technology. Quantum mechanical measurements, time development for open quantum systems, density matrices.

Qubits, quantum gates and quantum circuits. Universal quantum gates.

Quantum mechanical entanglement and teleportation and quantum cryptography.

Examples of important quantum algorithms. Quantum supremacy.

Interference, decoherence, bit errors and error correction.

## Examination

- INL1 - Homework problems, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratories, 1.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

## Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.