FDD3280 Quantum Computing for Computer Scientists 7.5 credits

Kvantberäkning för datavetare

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

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

Establishment

Course syllabus for FDD3280 valid from Autumn 2021

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Knowledge of linear algebra, Python or Matlab is required.

Language of instruction

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

Intended learning outcomes

After the successful completion of the course, the student will be able to:

- Describe the role of complex numbers and complex vector spaces in quantum computing
- Describe superposition of state, non-locality effects, probabilistic laws
- Compare classical computing to quantum computing in terms of advantages and disadvantages
- Generalize the concept of bit, classical gate, and registers to qubit, quantum gates and quantum registers
- List, formulate and describe key algorithms in quantum computing
- Develop a quantum computer emulator
- Describe the hardware realization of quantum computing

Course contents

The course is organized into two modules. We first learn about the mathematics and physics of quantum computing by introducing complex numbers, complex vector spaces, the leap from the classical world to the quantum world, basic quantum theory. The second module discusses architectures, algorithms, programming approaches, and hardware for quantum computing.

Examination

- EXA1 - Examination, 7.5 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.

In order to pass the course, the student must pass two assignments and one final course project.

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.