

# QST 203

## Theory of Quantum Devices

### Contact information

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**Professor:** TBA

Lecture: TBA

Contact: TBA

### Schedule

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Attendance in lecture is required. Weekly homework will be assigned and due the following week before class.

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**Grading:** 40% homework  
10% participation  
20% midterm exam  
30% final exam

**Introduction:** This is the most advanced theory course, with some elements of quantum transport and advanced many-body physics. The main goal is to introduce and compare different types of physical building blocks available for quantum computing. These include electron/nuclear spins, superconducting (Josephson junction based) circuits, light/microwave photons, and atoms/ions. Topological quantum computing, non-Abelian quasiparticles, and toric codes provide more advanced and longer term strategies. Physical sources of decoherence will be investigated, along with its mitigation strategies. Practical issues, such as scalability and comparison between different physical platforms and the associated devices, are to be addressed.

### Required Text:

Quantum Computation and Quantum Information by Nielsen & Chuang

### Weekly Calendar

Week 1	Requirements for quantum devices
Week 2	Atomic quantum computing 1
Week 3	Atomic quantum computing 2
Week 4	Superconducting quantum computing 1
Week 5	Superconducting quantum computing 2
Week 6	Semiconductor quantum computing 1
Week 7	Semiconductor quantum computing 2
Week 8	Semiconductor quantum computing 3

Week 9	Error correction in real systems
Week 10	Future quantum device platforms