Chapter 1

* Overview / [better name]
* Formalism
* Error correction
  + Surface codes
* Silicon Phosphorus
  + SiP on a surface
* Optimal Control

Chapter 2: Architecture design

* The heavy hexagon surface code
* The dipole surface code
* The exchange surface code
* **Heavy hexagon in silicon**
  + Design specifications
  + Why it’s a bad idea
    - Reduced frequency collisions not applicable to global control SiP
    - Criss cross wire maps poorly onto hexagonal lattice
    - Hexagon maps poorly onto silicon lattice.
      * Reduced symmetry results in greater number of variations due to placement imprecision
* Heavy square?
* Light hexagon (unlikely)?

Chapter 3: Quantum control

* Overview of Quantum control
* A useful example: Nuclear electron spin swap
* Designing pulses with GRAPE – allows for more complicated transitions
* 2 qubit CNOT
* 3 qubit CNOT

Chapter 4: 3 qubit gates with imprecision

* Original plan – similar to exchange surface code
* Performing gates in parallel
* Problems
  + Swapping with exchange active
  + Couplers as a means of avoiding control over exchange

Chapter 5: Tying together into a feasible architecture?

* No placement imprecision
  + Couplers become much more feasible
  + Nuclear spin – nuclear spin 3 qubit CNOT with GRAPE ?
* Placement imprecision incompatible with coupler architecture
  + Assume control over exchange
  + All 2 qubit CNOTs can be done in parallel
* Coupler architecture with full control over individual loading and unloading
  + Can do groups of 3 qubit CNOTs (if NE swap works)

Chapter 6 (if time): Noise

* Minimize noise for single 2 qubit CNOT
* Minimize noise for multiple 2 qubit CNOTs
* Minimize noise for single 3 qubit CNOT.