

Fall 2019: Quantum computing with noisy qubits

PHYS-GA-2023 (Open to grad and motivated undergrad students)

- **Students have 2 weeks to form groups of “2” for homeworks and final exam.**
- **Each group will get the same score**

Syllabus

- 1. Overview of quantum mechanics algebra**
- 2. Noisy Intermediate Scale Quantum systems (NISQ era)**
- 3. Mathematical formulation of quantum mechanics for implementing quantum**
- 4. Circuit model of quantum algorithm**
- 5. Realistic abstract machines**
- 6. Theory and treatment of classical and quantum noise**
- 7. Exact and approximated computation**
- 8. Approximate computing with real noisy qubits**
- 9. Realistic physical implementation**
- 10. Hardware programming of a superconducting qubit circuit**
- 11. Hands-on experience with quantum processors**
- 12. Simulation of spin chain and local Hamiltonian (e.g. IBM Qiskit, Google Cirq, Microsoft Q#)**
- 13. Quantum Simulation, adiabatic quantum computing**