

# QST 210-212

## Lab Modules

### Contact information

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**Professor:** TBA

Lecture: TBA

Contact: TBA

### Schedule

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Each quarter each student and their lab partner will select **five** laboratory experiments from the experiment menu, schedule dates for use of the equipment, and complete the project. Completion includes successful completion of a prelab theoretical exercise before the laboratory exercise, the laboratory experiment itself, and preparation of lab report. The lab report will be due the week following the laboratory exercise.

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**Grading:**      40% Prelab homework  
                     60% Lab report

**Introduction:** QSEC 210-212 are a series of Lab Modules to be completed by QSEC Master's students. Each quarter each student and their lab partner will select **five** laboratory experiments from the experiment menu, schedule dates for use of the equipment, and complete the project.

Lab Menu:

#### Quantum Optics

1. Polarization Optics
2. Ray tracing, ABCD Matrices, and Gaussian Beams
3. Optical Fibers
4. Optical Cavities
5. Lasers
6. Bell's inequality
7. Two-photon interference

#### Quantum Sensing:

1. Cryogenics
2. NMR I: Molecular fingerprints
3. NMR II: Environment decoupling and decoherence
4. NMR III: Spin transfer

5. NMR IV: NMR in metals
6. NV Center operation
7. NV Center

#### Quantum Device Laboratory

1. Ion trapping
2. Laser cooling
3. Ion single qubit operations
4. Quantum sensing with trapped ions
5. Semiconductor qubit single qubit operation
6. Semiconductor qubit decoherence study
7. Semiconductor qubit two-qubit gates
8. Semiconductor qubit quantum Fourier transform