Arctic Acoustic Fish Tracking Modeling
Course Outline

- Sound propagation in the ocean, including reflection, scattering, refraction, diffraction and absorption.
- The acoustic wave equation
- Speed of sound, including oceanic sound speed profiles
- Sonar equation
- Transmission loss
- Solutions of the wave equation. WKB approximations, normal modes, parabolic and ray-tracing.
- Snell's law
- Propagation loss. Sea-surface losses, bottom losses, sound absorption.
- Sound sources, including frequency dependent source levels.
- Hydrophone characteristics, including the use of arrays.
- Underwater noise levels, including wind noise, ice-noise, shipping noise, etc…
- Aural responses of marine mammals and fish
- Temporal and spatial variability in transmission characteristics
- Sound propagation in ice covered seas

Evaluation:

Two term papers (50% each)

Paper 1: Defining the Ocean Tracking Network (OTN) acoustical transmitter and receiver-array constraints. Describing equipment used, typical deployment scenarios. Equipment limitations. Acoustical characteristics of transmit tags and receiver arrays. Oceanographic conditions controlling sound propagation and detection ranges.

Paper 2: Development, description, and use of a ray-tracing model to investigate the limitations and detection thresholds of a specific OTN deployment case. Explore temporal variability in the array detection ability due to changes in oceanographic conditions.