Course Goals:

By the end of the course, having participated in the lectures, readings, and problem sets, students should be able to do the following:

Describe the basic function and sub-systems of an ice penetrating radar and explain what the design and parameters of a particular ice penetrating radar system mean for its ability to perform a particular geophysical measurement.

Understand the physical processes and energy budget of a round-trip radar pulse as described by the radar equation and perform back-of-the envelope calculations to determine the expected strength of returned signal for a given geophysical target.

Use a first principles understanding of sampling in time, space, and frequency to calculate the requirements for acquisition hardware, settings, and processing for a particular radar and acquisition scenario.

Understand the difference between and varieties of additive and multiplicative noise and identify the extent to which a particular noise mitigation strategy will improve the signal to noise ratio for a given source of noise.

Understand the physical processes involved with surface and volume scattering, describe the assumptions and limitations of various scattering models, and perform back-of-the-envelope calculations to identify the relative importance of different scattering mechanisms for a given geophysical setting and radar system.

Calculate the geometric and radiometric resolution of a given radar system and describe the relative influence of system parameters, processing, and geophysical setting on that resolution.

Describe the range of processing techniques commonly applied to ice penetrating radar data and explain how each type of processing affects the signal, noise, and resolution of the final radar product.

Provide a block-diagram level description of how ice penetrating radar data can be focused and explain the costs and benefits of such focusing in terms of scientific value and computational complexity.