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This tutorial dedicated to "Waves in Magnetic Plasmas" will be divided in two parts.

The first part will be devoted to the presentation of basic facts: it will be based on the classical Stix textbook, but read by an applied mathematician who desires to understand the physics of the problem. Some differences of viewpoint necessarily emerge. I will construct and detailed the dispersion relation for the propagation of a electromagnetic wave in a plasma with a dominant background magnetic field. Various configurations will be considered: one species dispersion relation, multi-species, hot plasma. A standard mathematical result on the eigenvalues of hermitian matrices show that all group velocities are bounded by the velocity of light.

The second part will consider variable coefficients and the notion of heating. I will explain that resonant heating is directly related to the ill posedness of the limit problem (that is when the friction coefficient is evanescent). It gives a rigorous mathematical basis to the notion of resonant heating. Three cases will be considered: O mode (no heating), Low Hybrid (resonance) and Cyclotron heating (resonance). This is based of ongoing research with Lise-Marie Imbert-Gérard and Ricardo Weder on exact solutions (inspired by the classical Budden solutions) and new integral solutions for Maxwell's equation with smooth coefficients.