

This thesis starts with a description of partial differential equations and their classification. The main aim is to describe numerical methods for their solving: the Finite Difference Method, the Finite Volume Method via finite difference formulation and especially the Finite Element Method. The Galerkin weighted residual method is applied to the heat equation and the Least Square FEM is applied to the Poisson equation as well as to the electromagnetic pulse propagation in cold electron plasma or dispersion environment in general. Results are compared with an analytical solution if available. The heat equation is solved using both fundamental solution and separation of variables leading to the Fourier series. Adaptive methods and *hp*FEM C++ numerical library HERMES are briefly mentioned too.