

Advanced PDEs. Nonlinear Schrödinger equations (S. Rota Nodari).

This course is an introduction to nonlinear Schrödinger equations (NLS). This kind of equations is relevant from a physical point of view, in particular because of their applications to nonlinear optics. Moreover, nonlinear Schrödinger equations also arise in quantum field theory, and more precisely in the Hartree-Fock theory. From a mathematical point of view, the NLS equation can be seen as a good model of dispersive equation which is technically simpler than other dispersive equations as the wave or the Korteweg-de Vries (KdV) equations.

The aim of this course is to discuss local and global existence results, conservation laws, and the existence and the qualitative properties of solitary wave solutions. This will involve a wide variety of branches of mathematics: functional analysis (Lebesgue and Sobolev spaces), harmonic analysis (Strichartz estimates) and variational methods.