

Title: Dirac Equation and Stability of Solitary Waves

Prerequisites:

Course Description:

1. Brief history of Schrodinger and Dirac equations
2. Instability of localized stationary solutions: Derrick's theorem (1964)
3. Zakharov--Kolokolov spectral stability (1967, 1973). Basics of the spectral theory in the Banach space.
4. Existence of solitary waves in nonlinear Schrodinger equation (Strauss, 1977) and orbital stability (Grillakis--Shatah--Strauss, 1987).
5. Dirac equation and the Soler model: Dirac matrices and the Pauli theorem, symmetries, conserved quantities
6. Solitary waves in nonlinear Dirac equation and in Dirac--Maxwell system
7. Bi-frequency solitary waves
8. The limiting absorption principle (Agmon, 1975)
9. Virtual levels of Schrodinger and Dirac operators
10. Spectral stability of (weakly relativistic) solitary waves in the nonlinear Dirac equation.
11. "Nonlinear eigenvalues": the Keldysh theory of characteristic roots (1951)