**Scuola Superiore di Catania**

Corso specialistico
a.a. 2019-2020

Argomenti avanzati in fisica quantistica
(Advanced topics in quantum physics)

**Module 1.** Functional Techniques: the generating functional of the Green's function, Functional perturbation theory, Path integrals and generating functionals, Generating functionals for scalar theory. Weyl Tranform and Wigner Function formalism for quantum mechanics: harmonic oscillator, quantum transport theory and semiclassical approximation.

**Module 2.** Non-perturbative phenomena in quantum mechanics and quantum field theory: (1) path integrals, solitons, instantons and quantization; (2) path integrals, renormalization group, running coupling constants.

**Module 3.** Integrability and exact solution of the bosonic quantum field theory in one spatial dimension through the Quantum Inverse Scattering technique. Applications to statistical physics and quantum many-body physics.