



UNIVERSITÀ
degli STUDI
di CATANIA

DIPARTIMENTO DI FISICA E ASTRONOMIA
“ETTORE MAJORANA”

DOTTORATO DI RICERCA IN FISICA
CICLO XXXIX A.A. 2023/2024

TITLE

Applications of the Functional Renormalization Group in Field Theory
2 CFU

Teaching staff

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Reception hours: 10-12 Tuesday

Program of the course:

- 1) Phase transitions. Second order phase transitions and critical points.
Critical manifold and classification of operators. Correspondence with renormalization in Quantum Field Theory. Renormalizability and fixed points.
- 2) Kadanoff-Wilson blocking. Momentum space blocking and Wegner-Houghton equation.
Flow equation of the Functional Renormalization Group (FRG) and its approximations.
- 3) Infrared regulator dependence. Proper Time RG flow.
- 4) Applications of the FRG to scalar theories in d-dimensions. Drawbacks in gauge theories.
- 5) Tricritical Lifshitz points. Modulated phase. FRG approach.

KNOWLEDGE REQUIRED: Basics of Quantum Field Theory and Statistical Mechanics.

Bibliography:

- [1] K.G. Wilson, J. Kogut: Phys. Rep. 12 (1974) pgs.75-200.
- [2] J. Berges, N. Tetradis, C. Wetterich: Phys. Rept. 363 (2002) pgs.223-386.
- [3] M. Peskin, D. Schroeder, “Introduction To Quantum Field Theory” (1995) CRC press.
- [4] Course notes.