DOTTORATO DI RICERCA IN FISICA
ANNO ACCADEMICO 2024/25

ADVANCED TOPICS IN QUANTUM FIELD THEORY

3 CFU

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Program of the course

- Renormalization and renormalization group in quantum field theory. Callan-Symanzik and Wilson renormalization group (RG) equations.
- Dimensional regularization, zeta function regularization, Wilsonian renormalization. Fine tuning, counterterms and physical tuning. Naturalness.
- Theories with Spontaneous Symmetry Breaking. Unbroken phase and RG flow in the ultraviolet regime. Instabilities: the RG "microscope". Renormalization in the broken phase. Tree level renormalization and Maxwell construction.

Bibliography

M.E. Peskin, D.V. Schroeder, An Introduction to Quantum Field Theory, Addison Wesley.

S. Pokorski, Gauge Field Theories, Cambridge University Press.

T. Muta, Foundation of Quantum Chromodynamics, World Scientific.