UNIVERSITÀ degli STUDI di CATANIA

DIPARTIMENTO DI FISICA E ASTRONOMIA
DOTTORATO DI RICERCA IN FISICA
ANNO ACCADEMICO 2021 – 2022
CICLO XXXVII

Advanced topics in Quantum Physics

3 CFU

Teaching staff
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Program of the course:

Classical and Quantum Electrodynamics. Physical processes. Appearance of infinite quantities: the problem, the physical meaning, the standard solution, beyond the standard solution.

Non-relativistic and relativistic many body theories: analogies and (deep) differences. Physical processes. Quantum field theories and their perturbative solution.

Non-perturbative phenomena in quantum physics. Classically degenerate vacua and low-lying states in quantum mechanics and quantum field theories. Examples. Tunnelling in quantum mechanics and quantum field theories.

Classical and quantum symmetries. Anomalies. Broken symmetries.

Bibliography:

- Mandl F., Shaw G., Quantum Field Theory, 2nd Edition, Wiley and Sons 2010.
- Ryder, L.H., Quantum Field Theory, Cambridge University Press, 2008.
- Maggiore M., A Modern Introduction to Quantum Field Theory, Oxford University Press (2006).
- Peskin M. E., Schroeder D.V., An Introduction to Quantum Field Theory, Addison-Wesley (2018).