Degree: **M.Sc. in Physics (PO von 2014)**

Module:	**Elective Advanced Lectures: Theoretical Physics**
Module No.: physics70c	

Course: universität**bonn**   **Advanced Quantum Field Theory for Condensed Matter Physics (T)**

Course No.: physics759b

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	3+2	7	ST

Requirements for Participation:
Quantum Field Theory for Condensed Matter Physics (physics759a)

Preparation:
Special interest in theoretical condensed matter physics and mathematical physics

Form of Testing and Examination:
Requirements for the examination (written or oral): successful work with the exercises

Length of Course:
1 semester

Aims of the Course:
Knowledge of advanced methods for evaluating quantum field theories
Knowledge of advanced models of quantum many-body systems

Contents of the Course:
Selected topics of modern theoretical condensed matter field theory, for example:
Formalism of generating functionals
Luttinger-Ward identities and conserving approximations
Bosonization
Dynamical Mean-Field Theory (DMFT)
Disordered systems and Anderson localization
Applications of field-theoretic methods to specific models

Recommended Literature:
A. Kamenev, Field Theory of Non-Equilibrium Systems, 2nd edition, Cambridge University Press (2023).
G. Stefanucci, R. van Leeuwen, Nonequilibrium Many-Body Theory of Quantum Systems, A Modern Introduction, Cambridge University Press (2013).
P. Coleman, Introduction to Many-Body Physics, Cambridge University Press (2015, reprinted 2017).
Th. Giamarchi, Quantum Physics in One Dimension, Oxford University Press (2004).