Title:	***Introduction to Thermal QFT***
Lecturer:	C. Dappiaggi
Duration:	24h
CFU:	4
Period:	April – May 2024
Content:	Aim of the course is to give an introduction to the basic mathematical structures at the heart of thermal, quantum field theories. In particular we will cover the following topics:

- Introduction to *-algebra and C*-algebras and their rôle in QFT
- Introduction to von Neumann algebras: factors (type I in QM and type III1 in QFT)
- Fock spaces and their structural properties
- Thermal Equilibrium States: KMS condition – definition, properties and examples in QFT. Stationary States and the notions of passivity and of detailed balance.
- Tomita-Takesaki modular theory: Modular Operators and their connection to thermal field theory (including Hawking radiation and the Unruh Effect)
- Relative Entropy in QFT and its connection to modular theory

Bibliography:
- O. Bratteli and D. W. Robinson, *Operator Algebras and Quantum Statistical Mechanics 1. C* and W* Algebras, Symmetry Groups, Decomposition of States*, (2010), Springer, 506p.
- O. Bratteli and D. W. Robinson, *Operator algebras and quantum Statistical Mechanics. Vol. 2: Equilibrium states. Models in quantum statistical mechanics*, (2013), 517p.

Notes:	It is highly likely that lecture notes will be written and shared with all participants. This is not a joyful promise, but an ineluctable fact of life like the sun rising and setting.