



**ICTP
SAIFR**

International Centre
for Theoretical Physics
South American Institute
for Fundamental Research



INSTITUTO
PRINCIPIA

Venue: Principia Institute – São Paulo, Brazil

July 1 – 5, 2024

**THEORY OF OPEN
QUANTUM SYSTEMS:
FUNDAMENTALS,
COLLISIONAL
MODELS, AND
PATH INTEGRALS**



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This one-week course is designed to provide master's students in physics with an introduction to advanced methods for tackling the dynamics of quantum many-body experiments. The initial focus of the course will delve into the language of open quantum systems, which serves as the foundational framework for experiments involving ultracold atoms or molecules, as well as modern many-body quantum optics. Specifically, lectures will elucidate notable distinctions from the unitary description of quantum mechanics, employing Lindblad master equations and collisional models. To reinforce understanding, tutorial sessions will be conducted to ensure a robust common foundation among participants.

In the latter part of the course, attention will shift towards demonstrating how non-equilibrium quantum field theory methods, initially formulated within the realm of high-energy physics, offer invaluable insights for deciphering the dynamics of contemporary quantum experimental setups. Students will gain insight into the technical and conceptual challenges inherent in these experiments, while exploring how a non-unitary path integral description of their dynamics can unlock regimes beyond the reach of conventional numerical or analytical approaches. The course will also offer a glimpse into the frontiers of a specific class of experiments: the realm of strongly correlated dynamics in driven-open systems of many-body cavity quantum electrodynamics.

There is no registration fee and limited funds are available for travel and local expenses.

Application deadline: May 11, 2024

Online application and more information:

www.ictp-saifr.org/toqs2024



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