

Quantum Information (and Thermodynamics)

Perimeter Institute Summer School 2020

Instructor information

Alioscia Hama

Course description

The aim of this course is to understand the thermodynamics of quantum systems and in the process to learn some fundamental tools in Quantum Information. We will focus on the topics of foundations of quantum statistical mechanics, resource theories, entanglement, fluctuation theorems, and quantum machines.

Each 90-minute session will include 45 minutes of lecture time and 45 minutes tutorials, in which you will work in groups to solve problems related to the lecture content.

Learning outcomes

By the end of this course students should be able to:

- Understanding how statistical mechanics emerges from the unitary evolution of a quantum system.
- Understanding the concepts of work and thermal machines in a quantum setting.
- Understanding the quantum thermodynamic demons, Landauer's principle and the like.
- Becoming ready to study the literature in the field and to start a research project.

Tentative course schedule

Lecture 1	Foundations of Quantum Statistical Mechanics - Entanglement
------------------	---

Lecture 2	Resource Theories and Quantum Information
------------------	---

Lecture 3	Quantum Thermal Operations
------------------	----------------------------

Lecture 4	Fluctuation Theorems and Quantum Information
------------------	--

Lecture 5	Quantum Thermal Machines
------------------	--------------------------
