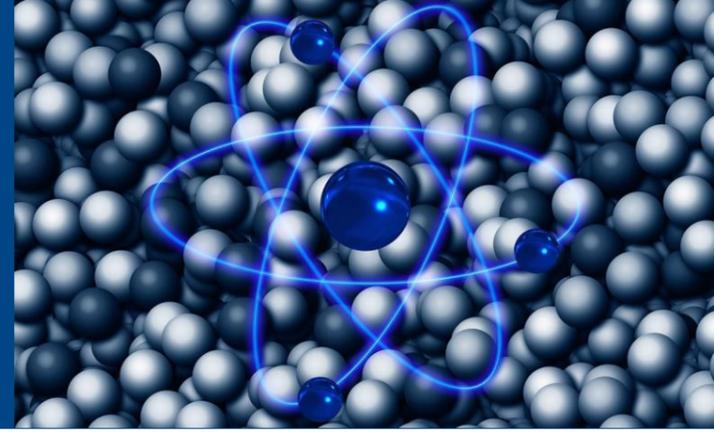


Lecture series on *Quantum Engineering* at Université Paris-Saclay



5th series of lectures organized by the IQUPS** network, open to Master students, PhD students, Post-docs, and researchers.
The ensemble of the two courses is eligible as “complément de formation initiale” for EDOM and EDPIF students.

Attendance is free but registration is *mandatory* (by email to iqups@universite-paris-saclay.fr)

Quantum fluids of light

by Jacqueline Bloch (C2N) and
Quentin Glorieux (LKB)

Open Quantum Systems:

Foundations and Applications
by Laurent Sanchez-Palencia (CPhT)

26 November; 10, 12 and 17 December 2019 from 9:15 to 12:30
C2N, grand amphitheâtre*

Program:	9h15-10h45	11h-12h30
November 26 (Tuesday)	L. Sanchez-Palencia	J. Bloch
December 10 (Tuesday)	J. Bloch	L. Sanchez-Palencia
December 12 (Thursday)	L. Sanchez-Palencia	J. Bloch
December 17 (Tuesday)	Q. Glorieux	L. Sanchez-Palencia

Quantum Fluids of Light (by J. Bloch and Q. Glorieux)

When confining photons in semiconductor lattices, it is possible to strongly modify their physical properties. Photons can behave as finite or even infinite mass particles, photons can propagate along edge states without back scattering, photons can become superfluid and behave as massive interacting particles. These are just a few examples of properties that we can imprint into fluids of light in semiconductor lattices. Such manipulation of light present not only potential for applications in photonics, but great promise for fundamental studies. One can invent artificial media with very exotic physical properties at the single particle level and progress toward the generation of multi photons correlated states. One can also simulate complicated Hamiltonians with light to explore problems not accessible with ultra cold atoms.

- The three first lectures will be delivered by Jacqueline Bloch and dedicated to the physics of quantum fluids of light (also called polaritons) in semiconductor microcavities .

- Quentin Glorieux, LKB, Paris will give the last lecture and describe a different platform for the study of quantum fluids based on photons propagating through a hot vapor of Rubidium atoms in the paraxial approximation

Open Quantum Systems: Foundations and Applications (by L. Sanchez-Palencia)

The dramatic progress in the design of materials and synthetic simulators now allows to realize controlled quantum systems rather well isolated from their environment. Yet, the coupling to the environment (bath) cannot be ignored and open systems are ubiquitous in Nature. It gives rise to a rich competition between coherence and dissipation, and novel dynamical effects. While coupling a system to a bath typically yields decoherence, recent works have shown that dissipation can be engineered to control many-body systems and engineer quantum entanglement.

The aim of this course is to give an introduction to open quantum systems.

We shall introduce the formalism and discuss applications to quantum technologies.

* C2N: Centre for Nanoscience and Nanotechnologies, 10 Boulevard Thomas Gobert 91120 Palaiseau (close to polytechnique and IOGS)

** Ingénierie Quantique à l'Université Paris-Saclay (<https://www.universite-paris-saclay.fr/fr/recherche/projet/iqups-ingenierie-quantique>)