- High-level Master training at the crossing between **fundamental** physics and its **applications** in nanotechnologies and quantum technologies.

- Provide a solid knowledge in nanophysics and quantum physics for students willing to pursue a Master 2 and a **PhD** in these fields.

- **Multi-disciplinary** training with courses from other fields of nanosciences such as soft matter, biophysics and nanochemistry.

- Open to students with a Bachelor in physics (or equivalent) from **national** and **international** origin.
# M1 NanoPhysics & Quantum Physics

## Semester 7

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<th>Core courses</th>
<th>Elective courses</th>
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<td>Professional insertion</td>
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<td>Solid state physics I</td>
<td>French as foreign language</td>
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<td>Semiconductor physics</td>
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<td>Magnetism and nanosciences</td>
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<td>Optics</td>
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<td>Statistical physics</td>
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<tr>
<td>Mechanics at the micro &amp; nano-scale</td>
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<td>Surface and interface</td>
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<td>Image and signal processing</td>
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<td>Electrochemistry</td>
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</table>

## Semester 8

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<th>Core courses</th>
<th>Elective courses</th>
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<tr>
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<td>Nanosciences II</td>
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<td>Modeling and numerical simulations</td>
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<td>Quantum labworks</td>
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<td>Molecular electronics and magnetism</td>
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<td>Physics of 2D nanomaterials</td>
<td>Quantum photophysics</td>
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<td>Thin Films</td>
<td>Research internship (2 months)</td>
</tr>
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</table>

[web site → click here](#)
Motivations

- Fundamental and applied courses on the physical properties, growth, advanced characterization, and applications of nanostructures.

- Specialization in nanophysics, within the broader field of nanosciences and with knowledge on quantum applications.

- Pluri-disciplinary experimental training on top-levels equipment of research laboratories and clean-room facilities.

- Preparation to a PhD in a research laboratory or a nanotech R&D company.

Pre-requisites

- Open to national and international students.

- Students with a Master 1 or a 4-year Bachelor in Physics.

- Courses on Quantum Physics, Solid State Physics, Semiconductors, Optics.
Core courses
Elaboration of nanostructures and physics of 2D materials
Advanced characterization techniques for nanostructures
From nanofabrication in research labs to VLSI

Applications
Advanced semiconductor devices
Nanophotonics and plasmonics
Nanomagnetism and spintronics
Nanomaterials and energy

Specializing courses
- Quantum thematic courses:
  Quantum condensed matter
  Quantum optics
- Broadening courses:
  Active matter
  Machine statistical learning

Thematic and interdisciplinary projects
Seminars + Modeling or Research training

Master thesis
5-months internship in a research lab

Contact: helene.bea@cea.fr
**Motivations**

- Working on fundamental quantum physics and/or participate to the emergence of Quantum Technologies.

- Enhancing connections between education, research and industry working on Quantum Technologies in adequation with national and European programs.

- Lectures, practicals, seminars covering the whole spectrum from fundamental quantum physics to implementations of quantum bits and algorithms.

- Preparation to a PhD in a research laboratory, a start-up, or a R&D company.

**Pre-requisites**

- Open to national and international students.

- Students with a Master 1 or a 4-year Bachelor in Physics.

- Courses on Quantum Physics, Solid State Physics, Semiconductors, Optics.
M2 QIQE
Quantum Information & Quantum Engineering

**Fundamentals**
- Open quantum systems
- Quantum condensed matter
- Quantum optics

**Implementations**
- Solid state qubits
- Quantum algorithms
- Nanomagnetism and spintronics

**Advanced instrumentations**
- Microwave and cryoelectronics
- From nanofabrication in research labs to VLSI

**Thematic and interdisciplinary projects**
- Seminars, Simulations, Practicals (IBM-Q)

**Master thesis**
- 5-months internship in a research lab

Contact: franck.balestro@neel.cnrs.fr

[web site → click here]
Objective:
Training the future generation of students in the field of quantum technologies including communication, computing, simulation, sensing, metrology.

Quantum Engineering and Hardware:
Coherent manipulation of quantum objects

Quantum Information and Software:
Processing and transfer of quantum information

Quantum Materials:
Collective quantum effects and new states of matter

Enabling Technologies:
Elaboration, cryogenics, cryo-electronics, spintronics

Quantum Engineering
Quantum devices
Read-out and coherent manipulation of qubits (spin, photon, electron)
Quantum information and Communication etc...

Enabling technologies
Cryo-CMOS, quantum amplifiers spintronics, cryogeny, lasers, micro-waves, ultra-fast electronics...

Quantum Materials
Non conventional magnetism superconductivity, 2D materials, spin chains, etc,…
Graduate School thematic program « Quantum »

Program for excellent students with international origin

Delivery of a « Quantum label » in addition to the Master diploma

Two year program with dedicated lectures and trainings

First year (M1)
- Quantum labworks : superconductivity, 2D materials, quantum optics,…
- Quantum statistics and interactions : second quantization, light-matter interaction,…

Second year (M2)
- Quantum condensed matter : theory of superconductivity, quantum transport,…
- Quantum optics : cavity quantum electrodynamics, quantum cryptography,…

Two-year « Quantum » scholarship from UGA Graduate School
For students with non-French high-school diploma
Follow this link to apply
M1 NanoPhysics & Quantum Physics
M2 NanoPhysics
M2 Quantum Information & Quantum Engineering
Graduate School thematic program « Quantum »

Presentation and answer to questions during the UGA Master Forum

Thursday the 3rd of March 2022
from 12:00 to 13:00 and from 16:00 to 17:00

Zoom link :
https://univ-grenoble-alpes-fr.zoom.us/j/95035879831?pwd=dkViMGF2S21IZERYYTd5Y21XOGVDUT09