

SCIENCES, TECHNOLOGIES AND HEALTH

# Nanophysics - Quantum physics 1st year

Master in Nanosciences and nanotechnologies



Target level  
Baccalaureate  
+4



ECTS  
60 credits



Duration  
1 year




Component  
UFR PhITEM  
(physique,  
ingénierie, terre,  
environnement,  
mécanique)






Language(s) of  
instruction  
English

## Presentation

The  Master Nanosciences Nanotechnologies is divided into three first-year tracks, corresponding to different disciplines within the field of nanosciences.

The M1 Nanophysics and Quantum Physics offers fundamental courses in condensed matter physics (quantum physics, solid state physics...) oriented towards the study of matter at the nanometer scale.


It gives access to the second-year programs :



-  M2 Nanophysics
-  M2 Quantum Information and Quantum Engineering
-  M2 Engineering of Micro and Nanostructures (alternating education/work)

This course also enables students to acquire multidisciplinary skills thanks to a wide range of courses and practical works covering the entire disciplinary field of nanosciences.

This training is strongly supported by research units in Grenoble working in this field, thus offering students numerous internship opportunities.

This program is open to international students. All courses are given in English.

For more information, visit the page of the  M1 Nanophysics and Quantum Physics on the website of the Master Nanosciences Nanotechnologies.

This M1 gives also access to the Graduate School program  Quantum, supported by the  QuantAlps research federation.

**International education** : Internationally-oriented programmes

## International dimension

### Study abroad as an exchange student

As part of this track, you have the opportunity to study for a semester or a year at a UGA partner University abroad.

The International Relations Officers of your faculty will be able to provide you with more information.

More information on :  <https://international.univ-grenoble-alpes.fr/partir-a-l-international/partir-etudier-a-l-etranger-dans-le-cadre-d-un-programme-d-echanges>  /

## Admission

## Access conditions

Education requirements :

- For the first year : holders of a bachelor degree in life sciences, or equivalent diploma

Admission criteria :

- See the section on applications and registration

For candidates whose country of residence is not included in the "Studies in France" portal (PEF) scheme, the calendar for the eCandidat application campaigns is available [here](#)

Public continuing education : You are in charge of continuing education :

- if you resume your studies after 2 years of interruption of studies
- or if you followed a formation under the regime formation continues one of the 2 preceding years
- or if you are an employee, job seeker, self-employed

If you do not have the diploma required to integrate the training, you can undertake a [validation of personal and professional achievements \(VAPP\)](#)

## Candidature / Application

Would you like to apply and register? Be aware that the procedure differs depending on the diploma, the degree obtained, or the place of residence for foreign students. Let us guide you simply by following this [link](#)

## Price of continuing education

Tuitions fees 2023-2024 : 243 €+100€ CVEC

## And after

## Further studies

This Master 1 allow student to choose one of the following Masters 2 :

**The Master 2 Nanophysics:** this international program aims to provide courses and training for elaboration, advanced characterization and deep studies of nanostructures physics like transport properties, optical and magnetic properties of nanostructures based on metal, dielectrics or semiconductors. This program is well suited to the needs of academic laboratories, offering many opportunities for internships or PhD programs. The multidisciplinary nature of the Nanophysics specialization will enable students to continue to deepen their knowledge by covering a wide range of research topics around nano-systems and their applications.

**The Master 2 quantum information and quantum engineering:** this new Master 2 program aim to provide students with expertise at the interface between the fundamental and experimental aspects of quantum physics with the aim to control quantum systems and quantum bits in the vision of their applications in the field of communication and quantum information processing. It will also allow the opening of multidisciplinary courses at the interface with mathematics and computer science. This program is fully consistent with the large developments in quantum technologies in Grenoble and worldwide. This program is well suited to the needs of academic laboratories, offering many opportunities for internships or PhD programs.

**The IMN Master 2:** The aim of this master's degree alternating is to provide multidisciplinary training in physico-chemistry, ranging from the development of nanomaterials and thin films and the associated characterizations (chemical, optical, microscopy) to several application fields related to different industrial sectors (mainly microelectronic components and photovoltaics).

## Useful info

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## Contacts

### Program director

Hermann Sellier

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### Administrative contact

Registrar's Office for the Master in Nanosciences  
and nanotechnologies

✉ phitem.master.nano@univ-grenoble-alpes.fr

### Administrative contact

Application

✉ phitem.candidature.etudiant@univ-grenoble-alpes.fr

### Continuing education manager

Laura DI RUZZA

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## Campus

🏠 Grenoble - University campus

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## Partner schools

This program can be followed as part of a double degree in partnership with University of Tsukuba (Japan). Professor in charge of the Double Degree: Mr. Etienne GHEERAERT.

This program can be followed as part of a double degree in partnership with Karlsruher Institut für Technologie (KIT) (Germany). Professor in charge of the Double Degree: Mr. Ingo SCHIENBEIN

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## Course location(s) - City

📍 Grenoble

# Program

## Organization

The curriculum of the first years contains :

- compulsory disciplinary courses in fundamental physics
- elective transversal courses in nanosciences and nanotechnologies
- experimental trainings in clean rooms and laboratories
- a research internship in a laboratory during 2 months

The M1 "Nanophysics and Quantum Physics" gives acces to three M2 programs :

- Master 2 "Nanophysics" (NP) : this international program provides courses on elaboration, advanced characterization, and in-depth physics of nanostructures based on metals, dielectrics, and semiconductors (transport properties, optical properties, magnetic properties). The program is well suited to the needs of the academic laboratories in Grenoble, offering many opportunities for internships and PhD thesis.
- Master 2 "Quantum Information and Quantum Engineering" (QIQE) : this international program provides expertise at the interface between fundamental and experimental aspects of quantum physics, with the aim to control quantum systems and quantum bits in the vision of their applications in the field of quantum communication and quantum information processing. It also proposes multidisciplinary courses at the interface with mathematics and computer science. This program is fully consistent with the recent developments of quantum technologies in Grenoble and worldwide, offering many opportunities for internships and PhD thesis.
- Master 2 "Ingénierie des Micro et Nanostructures" (IMN) : this program in French language provides a multidisciplinary training in physical-chemistry, covering the elaboration of nanomaterials and thin films, the associated characterizations (chemical, optical, microscopy) and the application fields related to different industrial sectors (mainly microelectronic and photovoltaic devices). The training alternates between periods of education and periods of work in a company.

The Master program "Nanophysics and Quantum Physics" gives you the opportunity to apply to the "Quantum" thematic program of the UGA Graduate School :

- The objective of the Graduate School is to offer a training of academic excellence, combining university studies and laboratory internships.
- Each program gathers students registered in different Master tracks or Engineer schools and working together in specific courses.
- Participation to the Graduate School is for two years (M1 and M2) and opens the possibility to obtain a two-years academic scholarship for the best international students (non-French baccalaureate holders).
- For more information, visit the website of the [UGA Graduate School](#).

## Master 1st year

### Semester 7

	Nature	CM	TD	TP	Crédits
UE Quantum Physics I	Teaching Unit (UE)				3 credits

UE Solid State Physics I	Teaching Unit (UE)				3 credits
UE Optics	Teaching Unit (UE)	50h		8h	6 credits
UE Semiconductor physics	Teaching Unit (UE)	20h	16h	12h	6 credits
UE Magnetism and nanosciences	Teaching Unit (UE)	20h		8h	3 credits
UE Research Intensive Track I	Teaching Unit (UE)				3 credits
UE Statistical physics I: Theory	Teaching Unit (UE)				3 credits
UE Microscale mechanics and fluidics I : Mechanics	Teaching Unit (UE)				3 credits
UE Surfaces and interfaces	Teaching Unit (UE)	14h	10h		3 credits
UE Image and signal processing	Teaching Unit (UE)				3 credits
UE Electrochemistry	Teaching Unit (UE)			12h	3 credits
1 or 2 UEs up to 6 ECTS in another program	Teaching Unit (UE)				
UE Occupational integration	Teaching Unit (UE)				3 credits
UE French as a foreign language	Teaching Unit (UE)				3 credits

## Semester 8

	Nature	CM	TD	TP	Crédits
UE Nanosciences I	Teaching Unit (UE)	17h		8h	3 credits
UE Solid state physics II	Teaching Unit (UE)	24h			3 credits
UE Modelling and numerical simulations	Teaching Unit (UE)				3 credits
UE Physical measurements at nanoscale by local probes	Teaching Unit (UE)	22h		8h	3 credits

UE Research Internship	Teaching Unit (UE)				6 credits
GS_Quantum_UE_Quantum Labworks	Teaching Unit (UE)		28h		3 credits
UE Nanosciences II	Teaching Unit (UE)	15h		11h	3 credits
UE Research Intensive Track II	Teaching Unit (UE)				3 credits
GS_Quantum_UE_Many-body quantum mechanics	Teaching Unit (UE)	26h			3 credits
UE Physics of 2D materials: from elaboration to properties	Teaching Unit (UE)				3 credits
UE Molecular electronics and magnetism	Teaching Unit (UE)				3 credits
UE Molecular Photophysics	Teaching Unit (UE)	9h	4,5h	12h	3 credits
UE Ray-Matter Interaction	Teaching Unit (UE)	22h	3h		3 credits
UE Materials Science	Teaching Unit (UE)				3 credits
UE Thin films	Teaching Unit (UE)	15h	6h	4h	3 credits
1 UE of 3 ECTS in other program	Teaching Unit (UE)				