



EMNano+ Master program

2nd year program at UGA

2nd year EMM Nano Master 2 program

Nanomaterials and nanochemistry		Quantum computing and nanoelectronics				Bionanotechnology and Nanomedicine		
Option Nanomaterials U Barcelona	Option Nanochemistry UGA Grenoble	Option Organic and molecular electronics TU Dresden, Chalmers	Option Quantum computing Chalmers	Option Quantum and nanoscale engineering UGA Grenoble	Option Nanoelectronics TU Dresden	Option Biophysics TU Dresden	Option Bionanotechnology JFU Grenoble	Option Nanopharmacotherapy U Barcelona
Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven
Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives
Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)

Common courses with the ~ 40 local Master 2 students registered for the local international Master program in Nanosciences-Nanotechnologies.

Detailed study program available on the EMM-Nano+ web page @UGA:

<https://master-nanosciences.univ-grenoble-alpes.fr/academic-program/quantum-engineering-quantum-information/emm-nano/>

2nd year EMM-Nano+ students @UGA for 2021-2022

- Quantum and nanoscale engineering: Corinna Fohn
Thomas Hellemans
James Keppens
Alba Ordonez Rodriguez
- Bionanotechnology: Michiel De Maeyer
Wout Mens
Hans Peter Seidel
- Nanochemistry: Allison Zhen Lee

Please check rapidly that UGA messages are not filtered by antispam at KUL or give us a second email adress !



EMM-Nano+ Quantum and Nanoscale Engineering specialty

Contact: Prof. David Ferrand david.ferrand@neel.cnrs.fr

Goal: quantum information, quantum engineering, nanophysics, quantum devices

Quantum information-quantum engineering core courses:

Complete program of lectures, Labworks and seminars covering the entire spectrum from fundamental quantum physics to experimental implementations of quantum bits and algorithms.

Local coordinator: **Prof. F. Balestro**

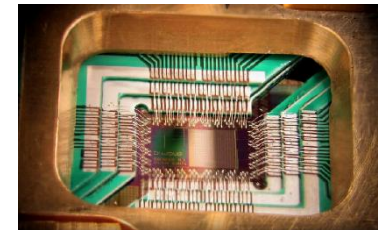


The syllabus can be **fully dedicated** to quantum engineering
or mixed with broadening courses on Nanophysics or advanced microelectronics

Nanophysics broadening courses

Broadening courses on the physical properties (experiment & modeling), growth and advanced characterization of nanostructures, covering topics from transport, nanophotonics nanomagnetism to applications (energy, microelectronics,...).

Local coordinator: **Prof. H. Bea**





EMM-Nano+ Quantum and Nanoscale Engineering specialty

Contact: Prof. David Ferrand david.ferrand@neel.cnrs.fr

• First Semester – September to January 30 ECTS + 15 ECTS Elective/broadening courses

Solid State Qbits	3 ECTS
Quantum condensed matter	3 ECTS
From micro-nanofabrication in research labs to VLSI	3 ECTS
Thematic and interdisciplinary project (seminars, Quantum Labworks)	6 ECTS

Completely new 15 ECTS specializing courses !

- Quantum optics (3 ECTS)
- Open quantum systems (3 ECTS)
- Quantum algorithms (3 ECTS)
- Microwaves and cryoelectronics (3 ECTS)
- Advanced semiconductor devices (3 ECTS)
- Nanomaterials and energy (3 ECTS)
- Advanced characterization techniques (3 ECTS)
- Nanophotonics and plasmonics (3 ECTS)
- Nano-magnetism and spintronics (3 ECTS)
- Elaboration of nanostructures /
Physics of 2D materials (3 ECTS)
-

(37 second year elective courses declared on Toledo)

• Second Semester – 4/5 month full time internship



EMM-Nano+ Quantum and Nanoscale Engineering specialty

Contact: Prof. David Ferrand david.ferrand@neel.cnrs.fr

<https://master-nanosciences.univ-grenoble-alpes.fr/quantum-and-nanoscale-engineering-emm-nano-specialty-853034.kjsp?RH=1612965420476>

- Federative institution web sites:

Quantum engineering Grenoble: <https://quantum.univ-grenoble-alpes.fr/home-quantum-engineering-805802.htm>

Labex Lanef: <https://www.grenoble-lanef.fr/>

Quantum silicon Grenoble: <https://www.quantumsilicon-grenoble.eu/>

INSTN/CEA <http://www-instn.cea.fr/formations/formation-par-la-recherche/doctorat/liste-des-sujets-de-these.html> (french)

Minattec: <https://www.minattec.org/en/all-opportunities/>

- Selection of Grenoble Laboratories (quantum, physics, Nanophysics, microelectronics, material science,...)

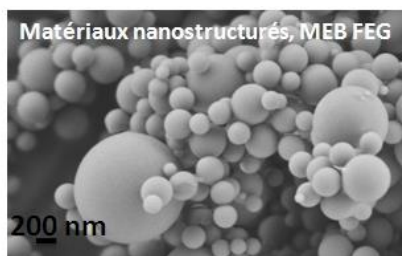
ST-Microelectronics (ST)	https://www.st.com/content/st_com/en/about/careers.htm
Neel Institute (Neel)	www.neel.cnrs.fr
Neel Institute– Condensed Matter and Low Temperatures (MCBT)	https://neel.cnrs.fr/institut-neel/les-departements-scientifiques/mcbt
Neel Institute –Physics Light Matter (PLUM)	https://neel.cnrs.fr/institut-neel/les-departements-scientifiques/plum
Neel Institute– Quantum electronics, Surfaces and spinTronics (QUEST)	https://neel.cnrs.fr/institut-neel/les-departements-scientifiques/quest
High Magnetic Fields National Laboratory (LNCMI)	http://lncmi.cnrs.fr/
Institut de recherche interdisciplinaire de Grenoble (IRIG)	https://www.cea.fr/drf/IRIG/Pages/Presentation.aspx
IRIG-Laboratoire PHotonique ELectronique et Ingénierie QuantiqueS (PHELIQS)	https://www.cea.fr/drf/irig/english/Pages/Laboratories/Pheliqs.aspx
IRIG-Spintronics and Component Technology (Spintec)	https://www.cea.fr/drf/irig/Pages/Laboratoires/Spintec.aspx
IRIG-Modeling and Exploration of Materials Laboratory (MEM)	https://www.mem-lab.fr/en
IRIG-Atomistic Simulation Laboratory (LSIM)	https://www.mem-lab.fr/en/Pages/L_SIM/Presentation.aspx
Electronics and Information Technology Laboratory (LETI)	www-leti.cea.fr
Condensed Media Physics and Modeling Laboratory (LPMCMC)	lpmmc.grenoble.cnrs.fr
Microelectronics Technologies Laboratory (LTM)	www.ltm-cnrs.fr
Interdisciplinary Physics Laboratory (Liphy)	www-liphy.ujf-grenoble.fr/
Institute of Microelectronics, Electromagnetism and Photonics (IMEP-LAHC)	www.imep-lahc.grenoble-inp.fr/
Laboratory of Innovations for New Energy Technologies and Nanomaterials (LITEN)	www-liten.cea.fr/
Laboratory of Materials and Physical Engineering (LMGP)	www.lmgp.inpg.fr/
Computer Technology, Microelectronics for Computer Architecture (TIMA)	www.tima.imag.fr
Techniques of Imaging, Modeling and Cognition (TIMC)	www-timc.imag.fr
Grenoble Electrical Engineering Laboratory (G2ELAB)	www.g2elab.grenoble-inp.fr/



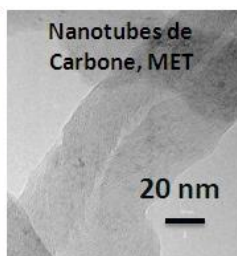
Prof. Cyrille Train cyrille.train@incmi.cnrs.fr

Goal: complete overview of the elaboration, characterization, properties and applications of a large variety of bulk materials and nano-objects.

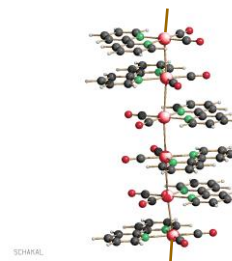
<https://master-nanosciences.univ-grenoble-alpes.fr/nanochemistry-emm-nano-specialty-853039.kjsp?RH=1554919096937>



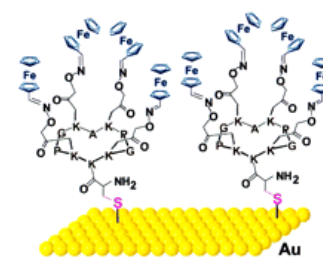
Nanoparticules



CNT



Molecular wires



Surface functionalization

Elaboration of any type of bulk materials matériaux (molecular, metallic, inorganic, hybrides, biologic) and their nanostructuration (films, wires, boxes, unique molecules)

Caractérisation: spectroscopies, local probes

Properties: (electro)chemical, physical, biological

Topics: Functional Materials, composites, (solar) energy, magnetism, molecular and micro-electronics, catalysis, sensing and bioanalysis, ...



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<https://master-nanosciences.univ-grenoble-alpes.fr/nanochemistry-emm-nano-specialty-853039.kjsp?RH=1554919096937>

• First Semester – September to January 30 ECTS

Molecular Nanomaterials 6 ECTS
(molecular magnetism, electron transf., Xray diffraction)

Functional Nanoparticles 3 ECTS
(applications in energy, catalysis and theranostics)

Advanced Functional Nanomaterials 3 ECTS

Nanosafety 3 ECTS

+ 15 ECTS Elective courses

- Research Training (3 ECTS)
- Polymers for nano-electronics (3 ECTS)
- Nanocomposites materials (3 ECTS)
- Surface functionalization (3 ECTS)
- Nanomaterials and energy (3 ECTS)
- From Nanofabrication in research labs to VLSI (3 ECTS)
- Bio-Molecular interactions: methods and applications (3 ECTS)
- Advanced characterization techniques for nanostructures (3 ECTS)
- Advanced SC devices (3 ECTS)
- Elaboration of nanostructures Physics of 2D materials (3 ECTS)
- Nanopores and membrane technologies (3 ECTS)
-

(37 second year elective courses declared on Toledo)



• Second Semester – 4/5 month full time internship

<https://master-nanosciences.univ-grenoble-alpes.fr/graduate-school-and-research/internships-in-nanochemistry-766586.kjsp?RH=1619194451005>

Topics devoted to nanomaterials centered either on synthesis and/or characterisation and/or functionality and/or application, many pluridisciplinary subjects with strong physical or biological concerns

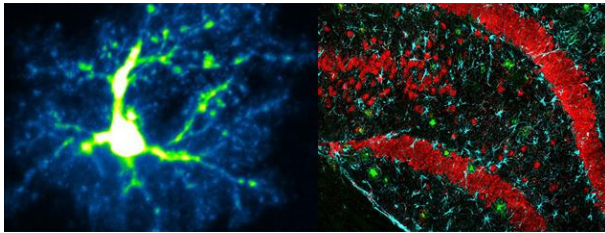
- Chemical Functionalization and Self-assembly of Nanoparticles for **electronic nose** (SYMMES)
- Investigate ligand-receptor interactions for the capture of circulating cells at the **blood vessel** wall (LiPHY)
- Construction of a molecular electrode for **hydrogen evolution** and uptake (LCMB)
- **Nanocaracterisation** of defects in MoS₂-type 2D semi-conductors by advanced photoemission, Raman spectrometry and photoluminescence (LETI)
- **Magnetic** nanostructures containing magnetic molecules (IN)
- Study of synthetic **RNA switches** for genetic regulation (LiPhy)
- Metal Organic Framework/Enzyme Electrodes for **Bioenergy** (DCM)
- Confined nucleation and growth of **molecular nanocrystals** for biophotonics (IN)
- Towards Bulk and Nanostructured Molecular Multiferroics (LNCMI) ...

• Selection of Grenoble Laboratories:

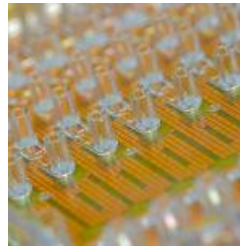
Plant Macromolecule Research Center (CERMAV)	www.cermav.cnrs.fr
Department of Molecular Chemistry (DCM)	dcm.ujf-grenoble.fr
IRIG-Molecular Systems and Nanomaterials for Energy and Health (SyMMES)	https://www.cea.fr/drf/irig/Pages/Laboratoires/Symmes.aspx
Science and Engineering of Materials and Processes (SIMAP)	simap.grenoble-inp.fr/
Laboratory of Electro and Physico-chemistry of Materials and Interfaces (LEPMI)	lepmi.grenoble-inp.fr/
High Magnetic Fields National Laboratory (LNCMI)	http://lncmi.cnrs.fr/
Neel Institute (Neel)	www.neel.cnrs.fr
Laboratory of Pulp and Paper Science and Graphic Arts (L2GP)	https://pagora.grenoble-inp.fr/en/research
Biology and Biotechnology for Health Laboratory (Biosante)	https://biosante-lab.fr/en
IRIG-Modeling and Exploration of Materials Laboratory (MEM)	https://www.mem-lab.fr/en
Institut Laue-Langevin (ILL)	https://www.ill.eu/
European Synchrotron facilities (ESRF)	https://www.esrf.fr/Jobs/traineeships
Laboratory of Materials and Physical Engineering (LMGP)	www.lmgp.inpg.fr/
Institut de Biologie Structurale (IBS)	https://www.ibs.fr/
IRIG-Cell & Plant Physiology Laboratory (LPCV)	https://www.lpcv.fr/en
IRIG-Chemistry and Biology of Metals laboratory (CBM-lab)	https://www.cbm-lab.fr/en
Grenoble Interdisciplinary Research Institute (IRIG)	https://www.cea.fr/drf/IRIG/Pages/Presentation.aspx

Prof. Hans Geiselmann (hans.geiselmann@univ-grenoble-alpes.fr)

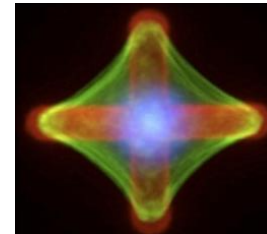
Goal: Biosensors, micro-fabrication, biomedical devices, mecano-biology, drug delivery, molecular markers, characterization of biological nano-materials



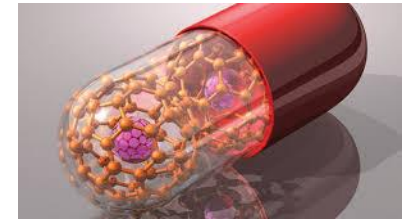
Cell engineering



Biosensors



micro-patterning



Drug delivery

- **Research** : more than 700 researchers in biomed, nanomed, biotech
- **Specialties**: Structural biology, biosensors, DNA origami, diagnostics, targeted drug delivery, neurosciences, mechano-biology
- **Career opportunities** : PhD, industry jobs in tissue engineering, therapeutics, diagnostics, ...



EMM-Nano+ Bionanotechnology specialty



Prof. Hans Geiselmann, hans.geiselmann@univ-grenoble-alpes.fr

<https://master-nanosciences.univ-grenoble-alpes.fr/bionanotechnology-emm-nano-specialty-853038.kjsp?RH=1613462564215>

• First Semester – September to January 30 ECTS

Bio-molecular interactions: 3 ECTS
methods and applications

Biosensors high and through analysis 3 ECTS

Micronanofabrication 3 ECTS
(12h courses & cell patterning labworks)

Surface Functionalization 3 ECTS

Nanosafety 3 ECTS

+ 15 ECTS Elective courses

- Machine learning (3 ECTS)
- Nanopores and membranes technol. (3 ECTS)
- Cell signaling (3 ECTS)
- Microfluidics (3 ECTS)
- Biomaterials Engineering (3 ECTS)
- Molecular markers (3 ECTS)
- Fundamentals of structural biology (3 ECTS)
- Optics for biological systems (3 ECTS)
- Characterization of biomolecular interactions at surfaces (3 ECTS)
- Physiology (3 ECTS)
- Neuroscience (3 ECTS)
- Research Training (3 ECTS)
-

• Second Semester – 4/5 month full time internship

(37 second year elective courses declared on Toledo)

EMM-Nano+ Bionanotechnology specialty

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<https://master-nanosciences.univ-grenoble-alpes.fr/bionanotechnology-emm-nano-specialty-853038.kjsp?RH=1613462564215>



- Federative institution web sites:

Labex Graal <https://www.labex-gral.fr/>

INSTN/CEA <http://www-instn.cea.fr/formations/formation-par-la-recherche/doctorat/liste-des-sujets-de-these.html> (french)

- Selection of few Grenoble Nanobiotech Laboratories:

Grenoble Institut des Neurosciences (GIN)	https://neurosciences.univ-grenoble-alpes.fr/
Institut of Advances Biosciences (IAB)	https://iab.univ-grenoble-alpes.fr/
Institut de Biologie Structurale (IBS)	https://www.ibs.fr/
IRIG-Molecular Systems and Nanomaterials for Energy and Health (SyMMES)	https://www.cea.fr/drf/irig/Pages/Laboratoires/Symmes.aspx
Interdisciplinary Physics Laboratory (Liphy)	https://www-liphy.univ-grenoble-alpes.fr/?lang=en
Laboratoire des Matériaux et du Génie Physique (LMGP)	www.lmgp.inpg.fr/
Neel Institute (Neel)	www.neel.cnrs.fr
Exploring the Dynamics of Proteomes (EDyP)	http://www.edyp.fr/web/
IRIG-Cell & Plant Physiology Laboratory (LPCV)	https://www.lpcv.fr/en
IRIG-Chemistry and Biology of Metals laboratory (CBM-lab)	https://www.cbm-lab.fr/en
IRIG-Modeling and Exploration of Materials Laboratory (MEM)	https://www.mem-lab.fr/en
Alpine Ecology Laboratory (LECA-OSUG)	https://leca.osug.fr/
Techniques of Imaging, Modeling and Cognition (TIMC-IMAG)	https://www.timc.fr/en/laboratory-presentation
European Molecular Biology Laboratory Grenoble (EMBL)	https://www.embl.org/sites/grenoble/
Clinatec (Clinatec)	http://www.clinatec.fr/en/
Plant Macromolecule Research Center (CERMAV)	https://www.cermav.cnrs.fr/
Airyballe Technologies (Airyballe)	https://www.cea-tech.fr/cea-tech/english/Pages/success-stories/aryballe-technologies.aspx
Grapheal Technologies (Grapheal)	https://fr.grapheal.com/
Smartforce Technologies (Smartforce)	http://www.smartforcetechnologies.com/
Promise Proteomics (Promise)	https://promise-proteomics.com/

2nd year EMM Nano Master 2 program

- 1st Semester : **lectures** from September 2019 to January 2020
- 2nd Semester : **30 ECTS Master internship**: 4 month minimum up to 6 month maximum done from February to end of August, evaluation at the end of June or end of August
- One Master 2 course: most often 3 ECTS ~ 20-25 hours per semester.
sometimes 6 ECTS ~ 45 hours per semester.
- To be graduated, 120 ECTS in your ISP are needed over the two years

-  Depending on the **credit number acquired in Leuven** (from 54 up to 66 ECTS credits)
- Choose the number of courses **during the 1st semester** in order to complete your curriculum up to 120 ECTS credits: from 24 ECTS up to 36 ECTS
 - Choose only EMM Nano **courses listed in Leuven** (<http://www.emm-nano.org/>)
 - Be mandatory courses are **different in the 3 EMM-Nano+ specialities**

- **First semester exams:** First session done between December to end of January.
Second session in May.
- **EMM Nano passing rules:** final grade of the course has to be at least 10/20
in order to obtain credits
- **French for foreigners (FLE) courses are offered to EMM students**

This course is not part of the EMNano+ Program and you will not obtain any credit for it. However, if you are a true beginner in French, it will help you in everyday life.