



Faculté des Sciences  
& Techniques

Le Mans Université

# MASTER

Applied physics and engineering physics

NanoPhysics and Advanced Optics  
(NOA)



# How does the MASTER program work?

If you want to work in the field of materials, semiconductor electronics, photovoltaics, optics, sensors, metrology, for major industrial fields or research, and you have a degree in Physics, Engineering Science, Physical Sciences or equivalent, then you could be a candidate for our Master's degree!

## Training objectives

The **NOA** course provides high-level theoretical and experimental skills in Materials Physics and Advanced Materials Optics. The course is offered in **both face-to-face** and **distance formats**. The course covers the structural properties and functionalities of materials (electronic, magnetic) and their applications in emerging technologies (carbon nanostructures, plasmonics, spintronics, photovoltaics, etc.) for industry (microelectronics, optics, energy, health, environment, defense, space, etc.) and research. This Master's degree also prepares students to pursue a doctoral thesis.

## Partners



The course draws heavily on skills developed at the Institut des Molécules et Matériaux du Mans (IMMM UMR 6283 CNRS) and the optical sensor and instrumentation engineering sector of the Ecole Nationale Supérieure des Ingénieurs du Mans (ENSIM). A partnership has also been established with the Institut Supérieur des Matériaux (ISMANS). An international dimension is given to this Master's program through student mobility and co-diploma arrangements (Double Master's degree in physics) recognized by the French Ministry of Foreign Affairs (European Label).

## YEAR 1 (classroom or distance)

### Semester 1

#### Semester 1 (30 ECTS)

- Quantum mechanics (1 ECTS) - refresher
- Optics (1 ECTS) - refresher
- Waves - propagation (1 ECTS) - refresher
- Solid state physics I (4 ECTS)
- Statistical Physics (5 ECTS)
- Quantum Mechanics I (3 ECTS)
- Mathematics and numerical methods (4 ECTS)
- Crystallography and scattering methods (4 ECTS)
- Signal processing I (2 ECTS)
- Anisotropic optics and optoelectronics (3 ECTS)
- English (2 ECTS)

### Semester 2

#### Semester 2 (Choice of 30 ECTS)

- Digital Electronics (3 ECTS)
- Spectroscopic methods (3 ECTS)
- Quantum Mechanics II (2 ECTS)
- Solid state physics II (2 ECTS)
- Atomic and Molecular Physics (3 ECTS)
- Introduction to nonlinear optics (2 ECTS)
- English (2 ECTS)
- Socio-professional practices (1 ECTS)
- Magnetism (3 ECTS)
- Laboratory practice (4 ECTS)
- Two units to choose among four
- Instrumental Optics (3 ECTS)
- Physics of complex fluids (3 ECTS)
- Data acquisition (3 ECTS)
- Nanomaterials for emerging technologies (3 ECTS)

## YEAR 2 (classroom or distance)

#### Semester 3 (Choice of 30 ECTS)

- Physics of solid and surfaces (2 ECTS)
- Advanced Diffraction Techniques (3 ECTS)
- Microtechnologies - Microsystems (2 ECTS)
- Nanophotonics (2 ECTS)
- English (2 ECTS)
- Microscopy techniques (2 ECTS)
- Intellectual property and innovation (1 ECTS)
- Advanced instrumentation in optics (2 ECTS)
- Nanophysics & Nanomagnetism (3 ECTS)

- Electronic transport of ultrafast phenomena (3 ECTS)
- Modeling of Nanomaterials (2 ECTS)
- Coherent imaging (3 ECTS)
- One unit to choose among four
- Plastic Electronics (3 ECTS)
- Optoacoustics and applications (3 ECTS)
- Soft Matter physics (3 ECTS)

#### Semester 4 (30 ECTS)

Research work in Laboratory in France or in European partner universities, or in industry

## Job opportunities

Graduates join university research laboratories or major research organizations (CNRS, CEA, INRA, ESRF, etc.) for doctoral training (preparation for a PhD) or take up positions in materials engineering and optical methods in industrial groups (R&D) for electronics, metrology, photovoltaics, defense, space, nuclear power, etc.)

Follow the careers of former students at <https://www.linkedin.com/groups/12422480/>

## How to register?

### Registration fee :

As an indication, the Master's registration fee for the 2023-2024 academic year is €243, payable after payment of the CVEC ([cvec.eticudiant.gouv.fr](http://cvec.eticudiant.gouv.fr)).

Scholarship holders are exempt from paying the CVEC and registration fees. Students who have received a conditional grant are automatically detected on the site, and can download their CVEC payment certificate at the end of the process.

Note: to apply for scholarships and accommodation (DES) for the start of the new school year, please go to the CROUS website in mid-January:

[www.crous-nantes.fr/bourses/](http://www.crous-nantes.fr/bourses/)



*The information contained in this document is given for guidance only and may be subject to change. It should not be considered as contractual.*

**Master's coordinator :**

**M1 coordinator:** P. Ruello,  
P. Daniel

**M2 coordinator:** B. Arnaud

EAD  Alternance

**Website:** <https://www.univ-lemans.fr/en/formation/catalogue-des-formationen/catalogue-des-formationen.html#nav>

**Education Department :**  
**Le Mans University:**  
**Faculty of Science :**

[sco-sciences@univ-lemans.fr](mailto:sco-sciences@univ-lemans.fr)  
[suio@univ-lemans.fr](mailto:suio@univ-lemans.fr)  
[www.univ-lemans.fr](http://www.univ-lemans.fr)  
[sciences.univ-lemans.fr](http://sciences.univ-lemans.fr)

+33 2 43 83 32 07  
+33 2 44 02 20 64

Le Mans Université  
Avenue Olivier Messiaen  
72085 Le Mans Cedex 9

