Master degree
Nanophysics and Advanced Optics
Developed with International partnership
(France, Lebanon, Morocco, Poland, Tunisia, Ukraine)

Scientific program
- Experimental, theoretical and modeling expertise in condensed matter physics and materials science.
- Nanoscale and mesoscopic materials for electronic, optic and magnetic applications
- Advanced optical methods (coherent imaging, ultrafast spectroscopy, …)
- Selected applications in emerging technologies (carbon nanostructures, plasmonics, spintronics, photovoltaics, multiferroics, smart materials, opto-acoustics, …)

Academic staff
- Department of Physics of the Faculty of Sciences and Technology of Le Mans University
- Institute of Molecules and Materials of Le Mans – Le Mans University and National Scientific Research Center CNRS,
- National Engineering School (Sensors, Instrumentation, Vibro-acoustics, Metrology) – ENSIM Le Mans University,
- International Experts and invited Professors in the field of functional nanostructures, optical engineering and solid state physics.

Organization
- 4 semesters with theoretical learning, practice exercises and projects in high-level research laboratories or R&D industries.

Career opportunities
- Scientific careers in academic institutions and industrial R&D sectors
- Engineer careers in research centers and manufacturing
- Project managers (materials, optics, instrumentation, metrology)
- Alumni: ST-microelectronics, Valéo, CEA, LNE, ONERA, Renault, University, CNRS.

Admission requirements
- Bachelor’s degree in physics, physical-chemistry, engineering
# Master degree
## Nanophysics and Advanced Optics

### Program

#### 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 (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)

#### Semester 3 (Choice of 30 ECTS)
- Physics of solid and surfaces (2 ECTS)
- Advanced Diffraction & Diffusion 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)
  - Molecular photonics (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

### Contact & informations:
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- Academic coordinator
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