

Master



Study at the Faculty of Physics and Engineering

Our faculty provides a comprehensive range of courses in the fields of physics and engineering sciences. These courses span a wide spectrum, covering the study of elementary particles, condensed matter, material-and nano-sciences, while also extending to applications in mechanics and electronics.

Teaching takes place across three distinct locations: the Historical Campus, the CNRS Campus in Cronenbourg, and the Technology Hall in Illkirch-Graffenstaden.

Our diverse training offers include approximately twenty degree programs, featuring alternatives such as work/study apprenticeship contracts, internships, international partnerships, and dual-qualifications with engineering schools.

What sets our program apart is its close affiliation with nationally and internationally acclaimed laboratories, as well as collaborations with the regional industrial sector.

This connection provides students with valuable opportunities for hands-on learning and professional experience and provides our faculty with significant visibility in the field of physics and engineering.

Sciences and technology major in physics

Physics of quantum and soft condensed matter | PhyQS

The specialty Physics of quantum and soft condensed matter (PhyQS) is one of the seven specialties offered in the second year (M2) of the Master of Physics of Strasbourg.

The PhyQS specialty aims to provide physicists with a broad fundamental training, suitable for both experimental and theoretical research. The PhyQS curriculum includes core advanced courses on quantum mechanics applied to condensed matter physics, statistical physics and radiation-matter interaction.

In parallel, students can, through their choices of elective courses, orient their training either towards quantum sciences and nanomaterials (electronic, optical, magnetic, spintronic properties of low-dimensional, mesoscopic or open quantum systems, etc.), or towards the physics of soft condensed matter and complex systems (surfaces and interfaces, complex fluids, colloids, active matter, etc.).

A project, focusing on modern topics in condensed matter physics is also proposed during the first semester. The project can be experimental, numerical or both.

The second semester of the PhyQS curriculum (semester 4 of the Master of Physics) consists in a research internship of at least four months.

[More information on physique-ingenierie.unistra.fr](https://www.phyqs.unistra.fr)

Training

 **Duration of the course: 2 years**

Programme and courses

M1 (Taught in English)

Semester 1 (S1) in Strasbourg

- Quantum mechanics and statistical mechanics (112h)
- Programming and actual research (58h)
- Experimental physics (60h)

1 free UE + 2 optional courses (56h) :

- Mechanics of continuous medias (in French)
- Astrophysical objects and their observations
- Group theory
- Ionizing radiation and detection methods
- General relativity
- Direction of time & Advanced statistical mechanics
- Variational principles and analytical mechanics
- Elements of quantum theory of collisions
- Photonics for quantum science and technology
- Soft condensed matter
- Project

Semester 2 (S2)

- Nuclear physics and elementary particles-Solid state physics (112h)
- Computer programming and numerical simulations (22h)
- Laboratory physics (16 days)

1 free UE + 1 optional course (56h) :

- Particles and astroparticles
- Stellar physics
- Atomic and molecular physics
- Introduction to physics of living systems
- Relativistic quantum mechanics
- Numerical methods in physics
- Electronics for quantum science and technology
- Critical phenomena and non-equilibrium statistical physics
- Project

M2 (Taught in English)

- Advanced quantum mechanics : applications to condensed matter (42h)
- Advanced statistical mechanics : out-of equilibrium processes (42h)
- Radiation-matter interaction : applications to condensed matter (42h)
- Experimental, numerical or both (18h)

1 free UE + 1 optional course (72h) :

- Open quantum systems
- Many-body physics
- Spin technologies
- Nanomagnetism and spintronics
- Electrons in solids: theory and modelling
- Physics of low-dimensional materials and surfaces
- Quantum dynamics: light and matter
- Light-matter interactions at extreme scales
- Interactions in soft condensed matter
- Surfaces and interfaces in condensed matter
- Physics of active systems
- Physics of polymers

Targeted skills

- Fundamental skills in the physics of condensed matter, as well as in advanced instrumentation techniques and scientific programming.
- Transverse skills: ability to work in an English speaking environment (the M2 lectures are all given in English), introduction to an international research environment. Numerical methods for data processing and simulations.



Partnership →

PhyQS has strong ties with the Quantum Science and Nanomaterials (QMat) international graduate school. qmat.unistra.fr

Local laboratories →

- Institute of physics and chemistry of materials of Strasbourg (IPCMS)
- Institute Charles-Sadron (ICS)
- European center of quantum sciences (CESQ, hosted by ISIS)
- Institute of supramolecular science and engineering (ISIS)
- Engineering science, computer science and imaging laboratory (ICube)
- Institute of materials science of Mulhouse (IS2M)

Internship

Being introduced to a research environment is a preliminary step towards a PhD. In semester 4, a full-time laboratory training of at least four months will allow students to test their ability to integrate a research team, to get familiar with current research topics, write a report on the performed research and evaluate their ability to work in autonomy. The topic of the internships can be chosen among proposals from local laboratories, as well as from French and international laboratories, and possibly research and development (R&D) companies.

Career opportunities

Functions

- Researcher
- University professor
- Research engineer

Relevant branches of activity

- Basic or applied research
- Technology development and management of large technical projects in the public and private sectors, universities, CNRS, CEA, IRSN, EDF, ANDRA, AREVA, companies developing sensors, measurement systems and simulation tools.

Continuation of studies possible

In this Master (M2 level) from the third year at TPS, ensuring a double engineering and Master degree.

Key figure

85%

success rate (over the last 4 years)

Contacts

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Admission and applications

Entry level

M1

→ Bachelor degree or equivalent (French or foreign "licence") in physics or applied physics.

 **Admission : candidature via monmaster.gouv.fr or Campus France**

M2

→ The direct admission to the M2 level is possible for students with strong academic records that have the M1 level.

 **Admission : ecandidat.unistra.fr or Campus France**

