



Master



Sciences and technology major in physics

Physics of radiation, instrumentation, detector and imaging | PRIDI

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.

This program provides the knowledge required for designing new detection instruments primarily dedicated to medical imaging, addressing the challenges raised in disciplines such as biology and medicine.

More information on physique-ingenierie.unistra.fr

PRIDI Faculté
de physique et ingénierie
Université de Strasbourg

Training

 **Duration of the course: 2 years**

Programme and courses

M1 (Taught in English)

Semester 1 (S1)

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

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

- Mechanics of continuous media (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

Semester 2 (S2)

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

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

- Particles and astroparticles
- Stellar physics
- Atomic and molecular physics
- Intro. 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

M2 (Taught in English)

- Fundamentals of Cellular and Molecular Biology for Physicists (54h)
- Signal Processing (32h)
- Radiation-Matter Interaction / Biological Effects (18h)
- Detectors and Instrumentation (30h)
- Physical Basis of Medical Imaging (18h)

- Markers and Tracers for Imaging (18h)
- Computing for Physics (18h)

1 free UE + 2 optional courses (36h) :

- Nuclear Magnetic Resonance
- New Optical Microscopy for Life Sciences
- Imaging with Ionizing Radiation
- Image Processing
- Dosimetry.

Targeted skills

- Collaborate with biologists, physicians, and chemists to design and develop tools that meet their expectations for clinical or preclinical imaging.
- Join a multidisciplinary team to carry out projects at the interface of physics, chemistry, and biology.
- Master the main imaging techniques used in humans and animals, such as ultrasound, X-ray Computed Tomography (CT), Single Photon Emission Tomography (SPECT), Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI), etc.
- Understand the fundamentals of cellular and molecular biology, mammalian physiology, and radiolabeling (visible, , and +).
- Learn the physical principles behind the main components of major detector families, as well as the acquisition and processing of photon detector data to generate 3D images.
- Understand the interaction between photons and matter, especially biological matter.
- Acquire knowledge in dosimetry to be well prepared for the DQPRM (Diploma of Qualification in Radiological and Medical Physics) examination.

Partnership with laboratories → Hubert Curien Multidisciplinary Institute (IPHC), Laboratory of Engineering Science, Computer Science, and Imaging (ICube), and Regional Cancer Institute.

Partnerships → General Electric, Thematic Interdisciplinary Institutes Quantum Science and Nanomaterials (QMat), and the Strasbourg Institute of Drug Development.

Merit scholarship → Obtaining a scholarship in the second year of the Master's program (M2) is possible upon review of academic performance.

Internship

In semester 4, the 15-week internship is an introduction to research. It must be carried out in a host laboratory, in industry, or in other institutions. This internship aims to enable the student to approach a new problem that requires new approaches or even new techniques.

Career opportunities

Functions

- Engineer at the physics/biology interface
- Medical physicist
- R&D engineer
- Etc.

After a PhD

- Lecturer-researcher or researcher
- Research engineer

Sectors

Companies in the field of imaging, detectors, and measurement systems, higher education, universities, high schools, and hospitals.

Continuing Studies

It is possible to continue studies in this Master's program (M2 level) starting from the third year at TPS, leading to a dual degree in engineering and Master's. PhD, the option to take the DQPRM (exam details: www-instn.cea.fr), the industrial world, Master's in management, etc.

Key figures

90%

Success rate (over the past 5 years).

Contacts

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Admission and applications

Entry level

M1

→ Entry level: L3 Physics from Unistra

→ Admission by application

M2

→ Entry level: M1 level required.

→ Admission by application

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

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