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Master

 *Teaching in English*

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

Astrophysical course and data science | ASD

The objective is to train by and for modern astrophysics independent people, able to understand the open questions of the discipline by relying on solid knowledge of state-of-the-art physics of objects of the Universe, and skillfully use the researcher's modern tools.

Key themes : stars, galaxies, compact objects, interstellar medium, cosmology, physical states and mechanisms, high energies, observation, modeling, numerical simulation, statistics, artificial intelligence, databases, virtual observatories.

 more information on astro.unistra.fr and physique-ingenierie.unistra.fr

 Observatoire
astronomique
de l'Université de Strasbourg
et du 

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)

Semester 3 (S3)

- Astrophysical Objects and Theories (76h)
- Data analysis (40 hours)
- Numerical physics and modeling in astrophysics (76h)

2 free UE + 1 optional course (60h) :

- Inverse problem theory and advanced data analysis
- Compact objects and high-energy astrophysics
- Evolution of galaxies
- Exoplanets and circumstellar discs

Semester 4 (S4)

- Bibliographic and observational projects (59h)
- Professional integration
- Research internship

Targeted skills and knowledge

- Good insight into the state of knowledge of the Universe and its components.
- Ability to understand high level courses describing the state of the art.
- Implementation and presentation of personal or team projects.
- Practice of modeling complex phenomena, analytically or numerically.
- Proficiency in several programming or scripting languages, and at least one database query language.
- Use of statistical tools and artificial intelligence to effectively confront theory and observations.
- Knowledge of Virtual Observatories
- Construction and operation of databases.
- Proficiency in technical and scientific English.
- Written and oral presentation of results.

Internship

In semester 4, **the 15-week internship** allows the students to test their taste and validate his skills for the job of researcher.

Scientific curiosity, constructive independence, motivation, reliability and rigor are the qualities necessary for the success of this period. The internship can be chosen from the proposals of the Strasbourg Astronomical Observatory, or take place in another laboratory (after favorable opinion of the course manager). About 40% of the internships took place abroad and 15% in companies.

Career opportunities

Sectors and functions

- Teaching professions
- Data scientist
- Dissemination of knowledge and scientific journalism
- Digital modeling (all disciplines) or image processing professions
- Advisor or IT developer
- Planetariums and materials for amateur astronomers, etc.

Further education

- Doctorate

After a doctorate

- Astronomer
- Teacher-researcher or researcher
- Research engineer

Key figures

95%

success rate (over the last 4 years)



The SVOM gamma-ray burst observatory
Crédit: CNES

Contacts

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Admission and applications

Entry level

→ First year admission : bachelor's degree or equivalent (French or foreign) course with a strong physics component. Admission by application.

→ Second year admission : possibility of direct admission to M2 on application. M1 level required or equivalent. 3rd year of Telecom Physique Strasbourg (leading to a double degree, engineering and Master).

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

